Progress Report

November 4, 2015

Steam Enhanced Extraction at the Former Williams AFB, ST012 Site

Mesa, AZ

1. Summary

This report covers the period of operations from Tuesday, October 27, 2015 through Monday, November 2, 2015. The following table provides a summary of the project operational status.

Table 1. Project Summary

	Value	Unit
Target Treatment Zone (TTZ) Soil Volume	410,000	cubic yards (cy)
Area	199,000	square feet (ft^2)
Upper Depth of Treatment	145	feet (ft) below ground surface (bgs)
Lower Depth of Treatment	245	ft bgs
Vapor Liquid Treatment Started	09/29/14	
Thermal Operations Started	09/29/14	
Last Process Data Update	11/02/15	
Last Temperature Data Update	11/02/15	
Estimated Total Days of Operation	422	days
Days of Operation	400	days
Days of Operation vs. Estimate	95	percent (%)
Estimated Total Energy Usage	11,343,000	kilowatt hours (kWh)
Total Energy Used	4,003,403	kWh
Used Electrical Energy vs. Estimate	35	%
Total Steam Injected	248.4	million pounds (lbs)
Projected Total Steam Injection	320	million lbs
Steam Injected Vs Projected	78	%
Total Mass Removed in Vapor Based on Photoionization Detector (PID) Readings	859,684	lbs
Total Mass Removed as NAPL	1,106,262	lbs
Average Daily NAPL Mass Removal Last Week	3,017	lbs/day
Total Vapor and Liquid Mass Removal (based on PID readings)	1,965,947	lbs
Average Power Usage Rate Last Week	527	kilowatts (kW)
Average Wellfield Vapor Extraction Rate Last Week	373	standard cubic feet per minute (scfm)
Average Condensate Production Rate Last Week	0.3	gallons per minute (gpm)
Average Water Extraction Rate Last Week	113	gpm
Total Water Extracted	61,813,441	gallons
Total Recovered Light Non-Aqueous Phase Liquid	168,381	gallons
Average Water Discharge Rate Last Week	146	gpm
Total Treated Water Discharge	81,892,000	gallons

Operational highlights from the past week include:

- Eductor skids were operated with 6 skids online or 5 skids online and 1 skid offline. Skids 1, 4, and 6, servicing the upgradient and downgradient edges of the site, were operated continuously. The average liquid extraction rate from the formation was approximately 113 gpm.
- By October 31, 2015 the Upper Water Bearing Zone (UWBZ) was brought back online at a rate around 12,000 lbs/hr.
- The average steam injection rate in the Lower Saturated Zone (LSZ) was 21,500 lbs/hr (or 43.0 gpm).
- The average steam injection rate in the UWBZ was 5,100 lbs/hr (or 10.3 gpm).
- The average steam injection rate in the Cobble Zone (CZ) was 7,900 lbs/hr (or 15.9 gpm).
- The average steam injection rate for all zones was 69.2 gpm.
- The net extraction from the formation was 43.8 gpm (approximately 1.6 times the water volume injected as steam was extracted as water).
- Collected process, wellfield and laboratory data per the sampling schedule.
- Conducted regular maintenance on the treatment system.
- Maintenance was performed on multi-phase extraction (MPE) wells CZ-10 and LSZ-2.
- The following MPE wells were identified as requiring maintenance during this operational period:
    - LSZ-5*
    - LSZ-15*

**Temperatures at these MPE wells are at boiling – well maintenance will be postponed until temperatures are below boiling due to health and safety concerns.*

2. Vapor Extraction

Figure 1 below shows the vapor extraction rate from the site. Note that the estimated steam extraction rate is a calculated value based on the water generated at the moisture separators after cooling the vapors from the wellfield. Based on energy balance analysis, additional steam is likely being pulled into and condensing in the liquid extraction system. This steam extraction is not measureable and not accounted for in Figure 1. Additionally the wellfield flow is calculated as the difference between the air stripper flows and thermal accelerator influent, and is therefore only an estimate.

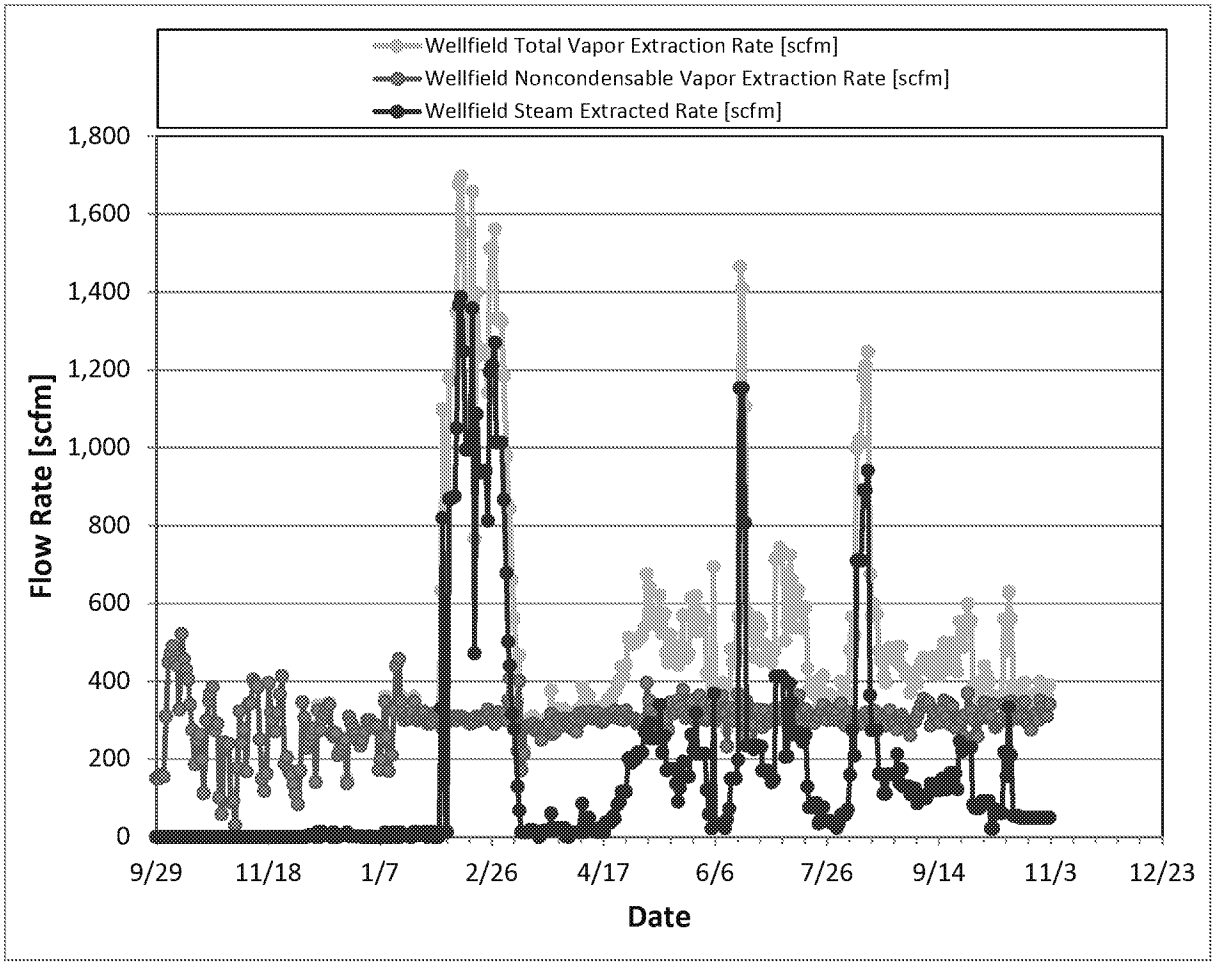

Figure 1. Vapor Extraction Rate

Note: Well SVE01M was tied into the SEE extraction system on June 5, 2015. Wells SVE10M and SVE14M were tied into the SEE extraction system on September 23, 2015.

3. PID Measurements

The following figure depicts the PID concentrations from the wellfield effluent to the effluent of the thermal accelerators collected since the start of operations. Note that PID readings of 0.0 parts per million by volume (ppmV) are shown in the figures as 0.01 ppmV due to the logarithmic scale that does not allow display of 0-values. Accelerator influent readings are interpolated for days where no data is collected, since the value is used in the mass removal calculation.

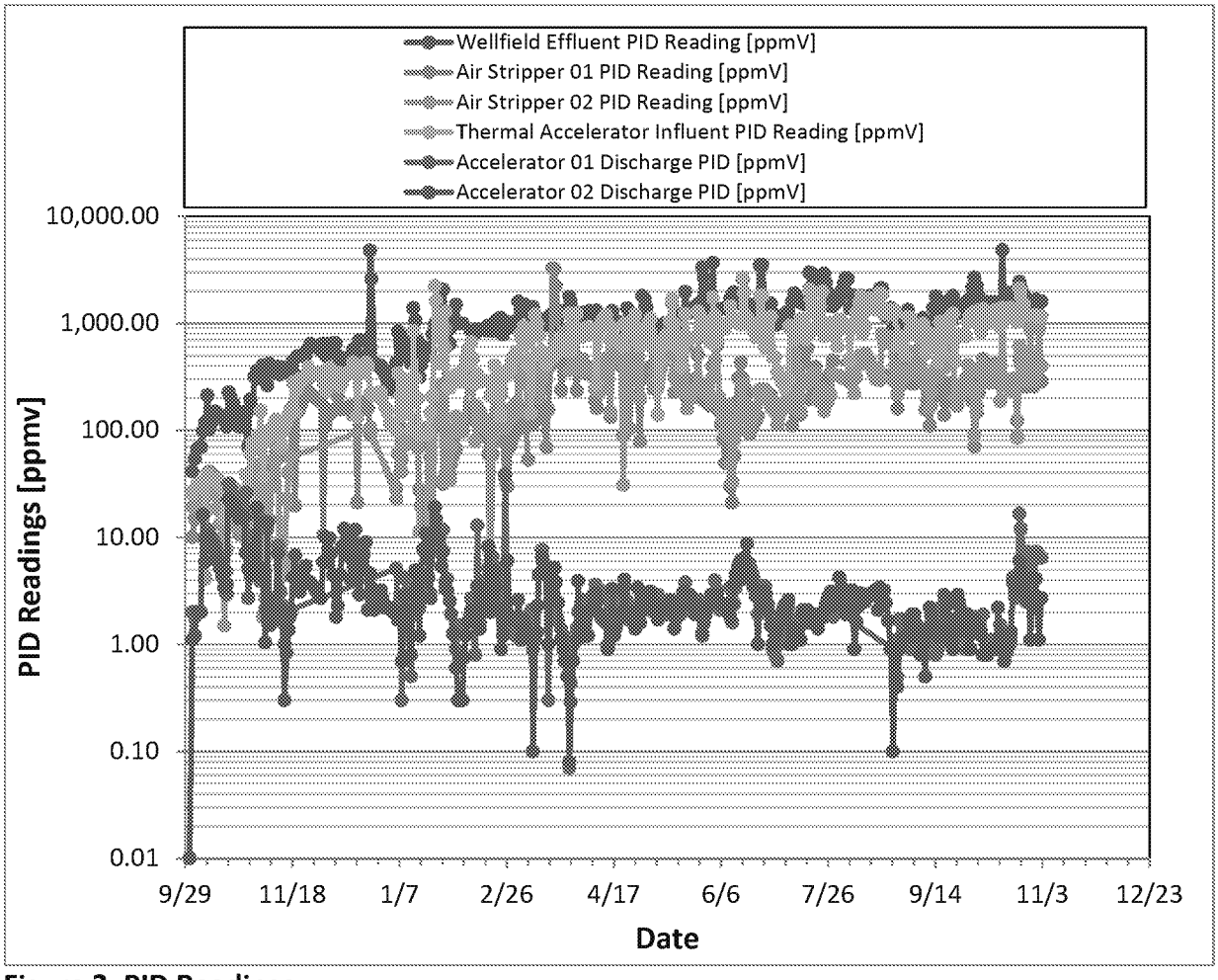

Figure 2. PID Readings

4. Mass Removal

The mass removal is calculated based on the PID and laboratory data collected at the thermal accelerator influent and the LNAPL recovered. The figure also depicts the mass removed based on PID and laboratory data.

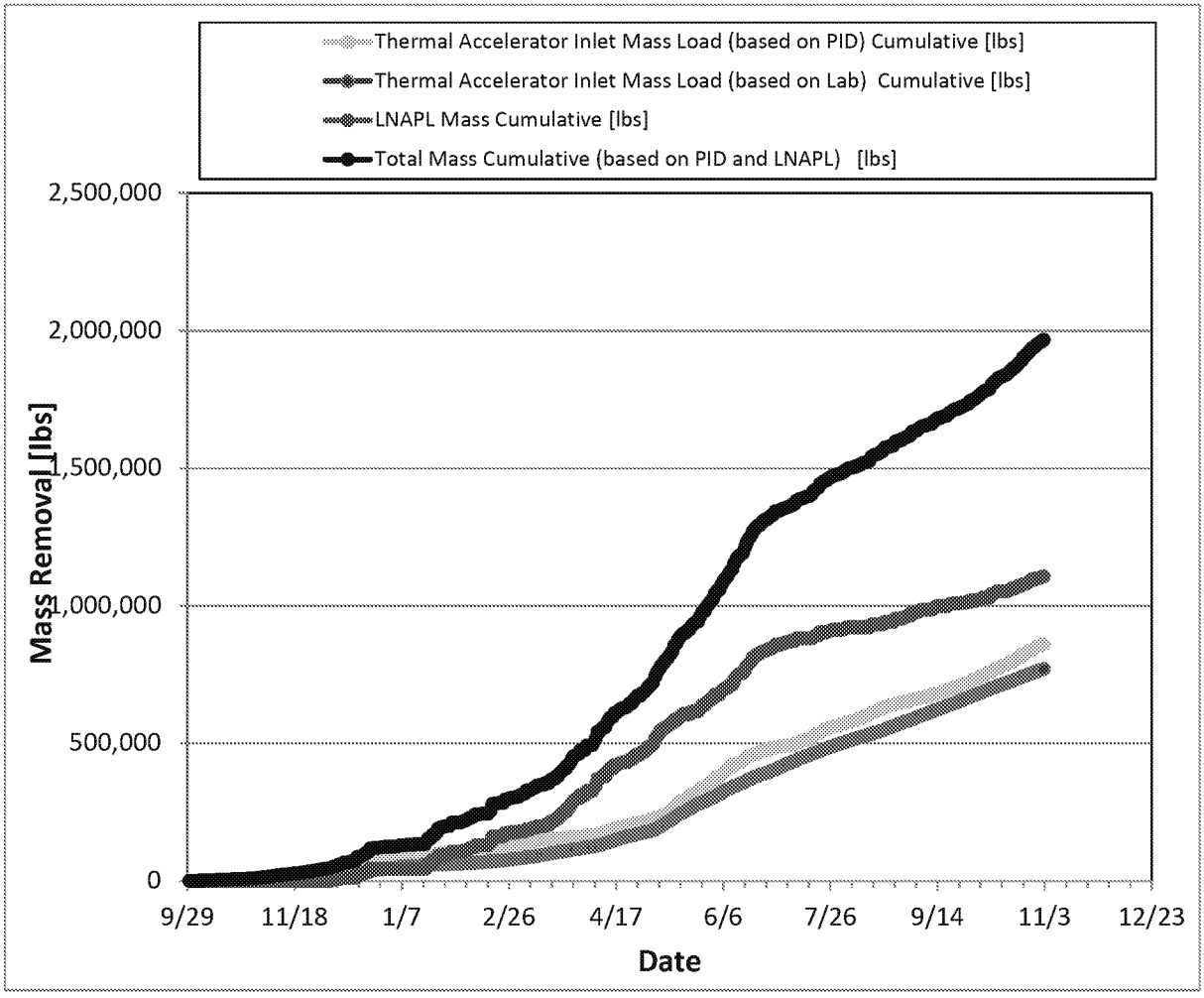

Figure 3. Mass Removal

Note: A NAPL density of 6.57 lbs/gallons was used to convert the NAPL volume to pounds. A molecular weight of 106,168 g/mol (corresponding to xylene) was used to convert PID readings to concentrations.

5. Daily Mass Removed

Figure 4 outlines the daily mass removed as vapor and LNAPL. The total daily mass removed is the combination of vapor and LNAPL. The liquid mass removal is captured in the vapor phase due to the volatilization of liquid contaminants in the air strippers.

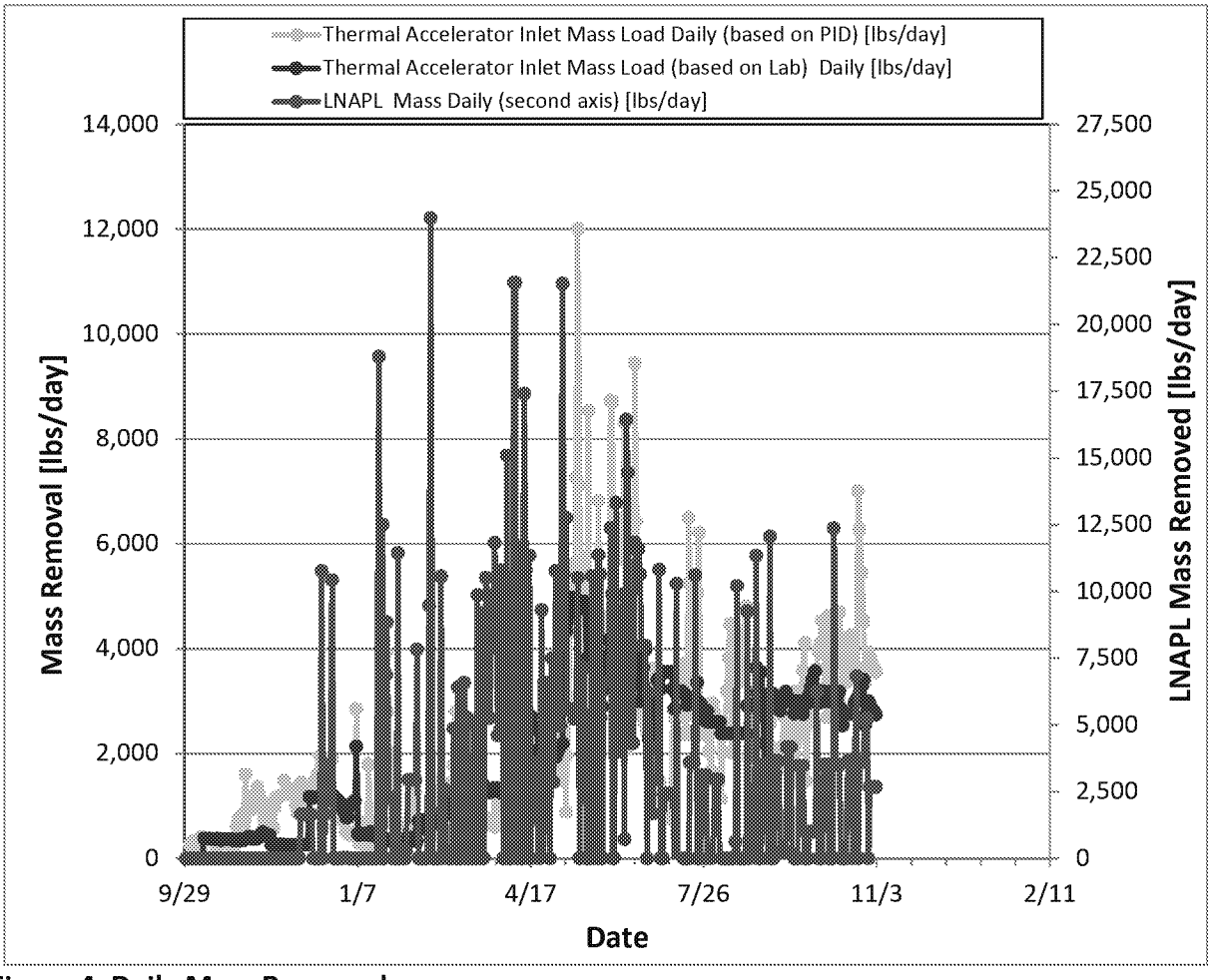

Figure 4. Daily Mass Removed

Note: Laboratory data are not collected daily. The "Thermal Accelerator Inlet Mass Load (based on lab)" is an average daily rate of actual lab data collected. The report has been updated based on lab data received for samples collected through September 9, 2015. Note that accumulated LNAPL is pumped through the NAPL conditioning system in a batch style process.

6. Power Usage

The cumulative power usage is shown below. All electricity used at the site is utilized to run the process system and steam generators.

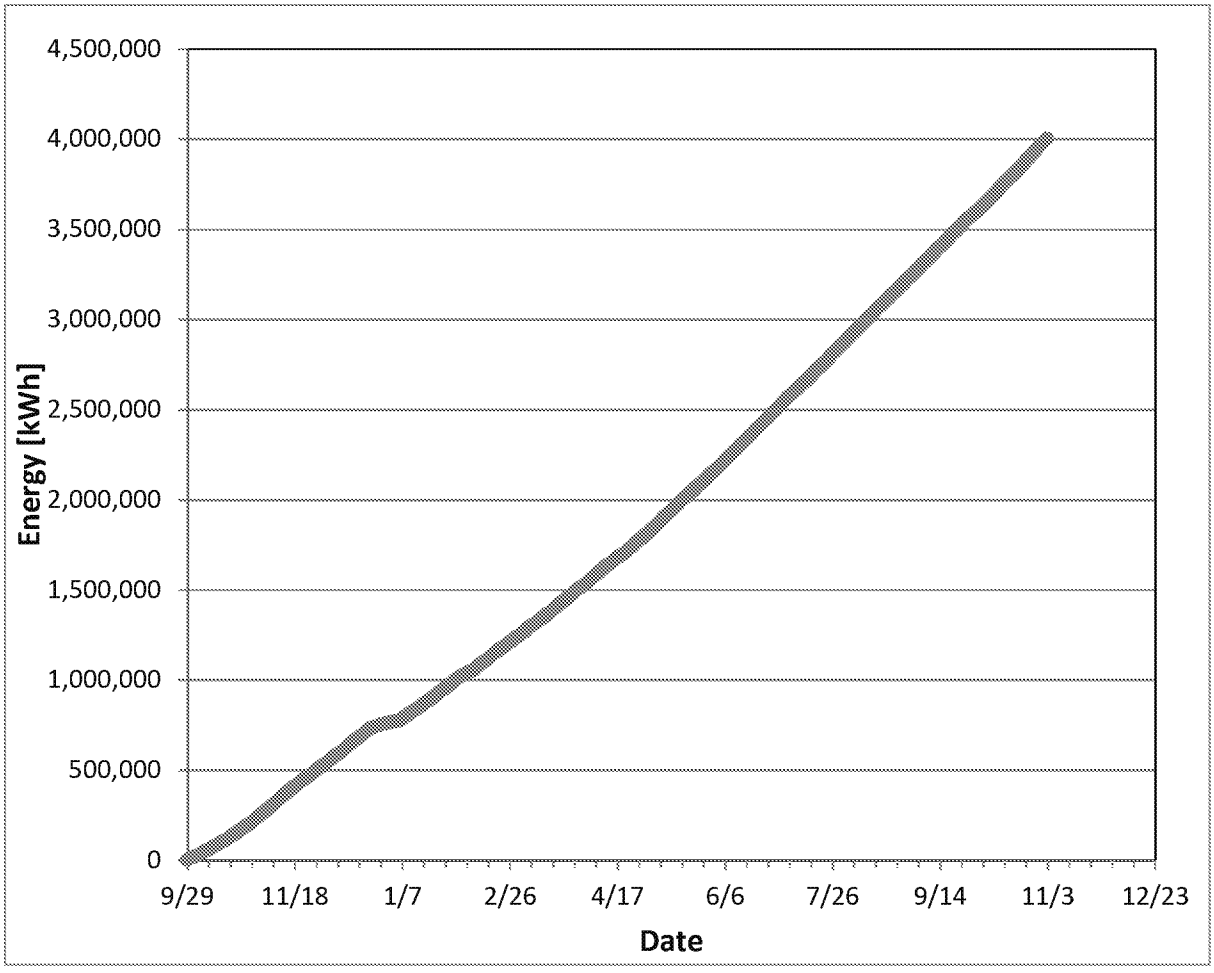

Figure 5. Cumulative Power Usage

7. Average Temperature

The average soil temperatures as degrees Celsius (°C) and degrees Fahrenheit (°F) are shown in the figure below by treatment zone (i.e., LSZ, UWBZ and CZ). The average temperature graph calculations only include TMPs 01, 05, 09, 12, 13 and 15 for the CZ and UWBZ average temperatures, and all TMPs except TMPs 02 and 10 for the LSZ average temperature. Please note that three temperature monitoring arrays (TMPs 04, 09 and 17, as well as the 220 ft bgs sensor for TMP 06 and the 170 ft bgs and below sensors for TMP 05) were taken offline on June 16, 2015; this affected the UWBZ average temperatures. Also, please note that suspect high temperature recording sensors at TMP 15 have been removed from the average soil temperatures below in Figure 6.

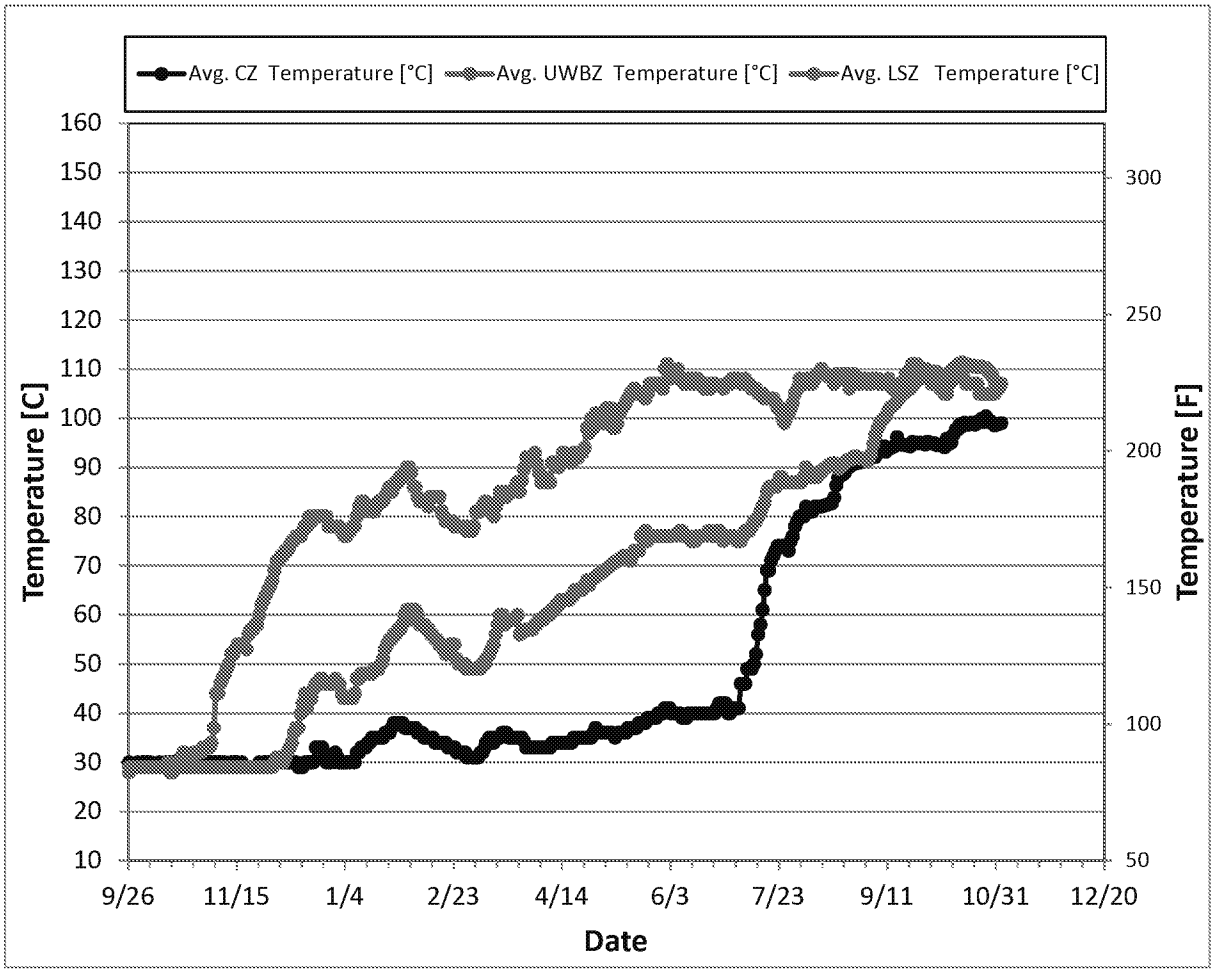

Figure 6. Average Soil Temperatures

Note: Following troubleshooting, it has been determined that TMPs 04, 09 and 17 are compromised and have been disabled; the 220 ft bgs sensor for TMP 06 and the 170 ft bgs and below sensors for TMP 05 have also been disabled.

8. Vertical and Horizontal Temperature Profiles

The following Figures 7 and 8 show the temperature in °C versus depth profiles for each of the 17 individual temperature monitoring points. TMPs 04, 09, 15 and 17 were offline during this operational period. Selected sensors were offline at TMPs 01, 02, 03, 06, 07, 10 and 13 during this operational period. Additionally, the bottom part of TMP05 (from 165 ft bgs and deeper) has been disabled due to sensor errors.

Temperature highlights for the past week include:

- TMP 08 has seen a continued increase in temperature between 175 and 235 ft bgs.
- TMP 11 has seen a decrease in temperature between 215 to 235 ft bgs.
- TMP 12 and TMP 14 have seen a decrease in temperature between 175 and 190 ft bgs.
- Perimeter wells TMP 02 and TMP 10 have remained stable over the last week.

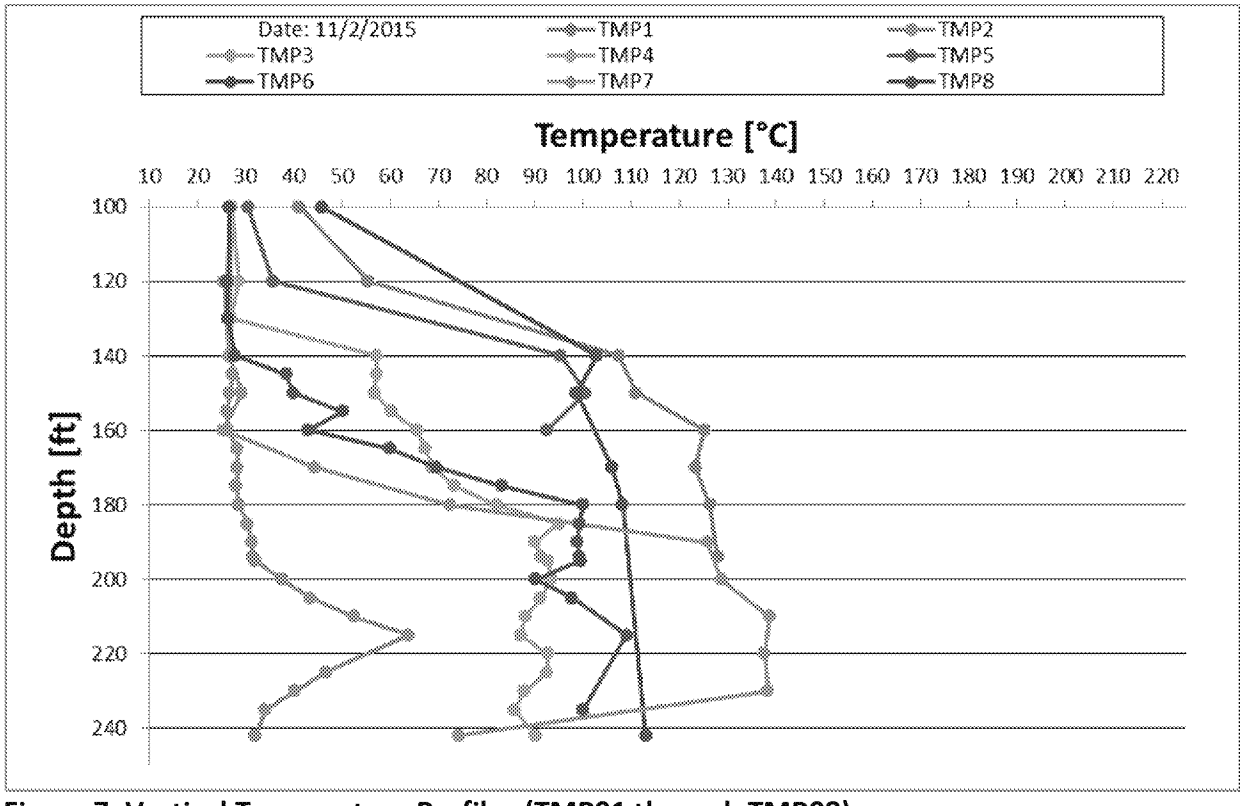

Figure 7. Vertical Temperature Profiles (TMP01 through TMP08)

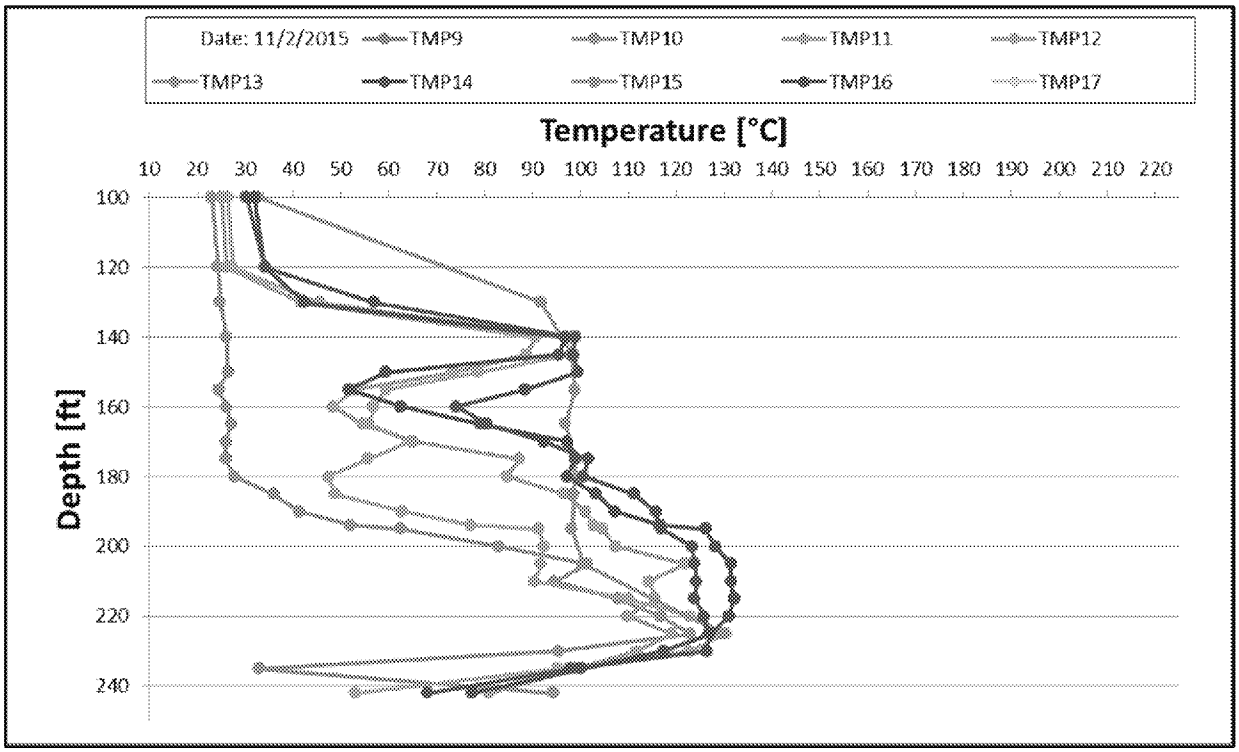

Figure 8. Vertical Temperature Profiles (TMP09 through TMP17)

Figures 9-12 show the horizontal temperature distribution across the site in four depth intervals.

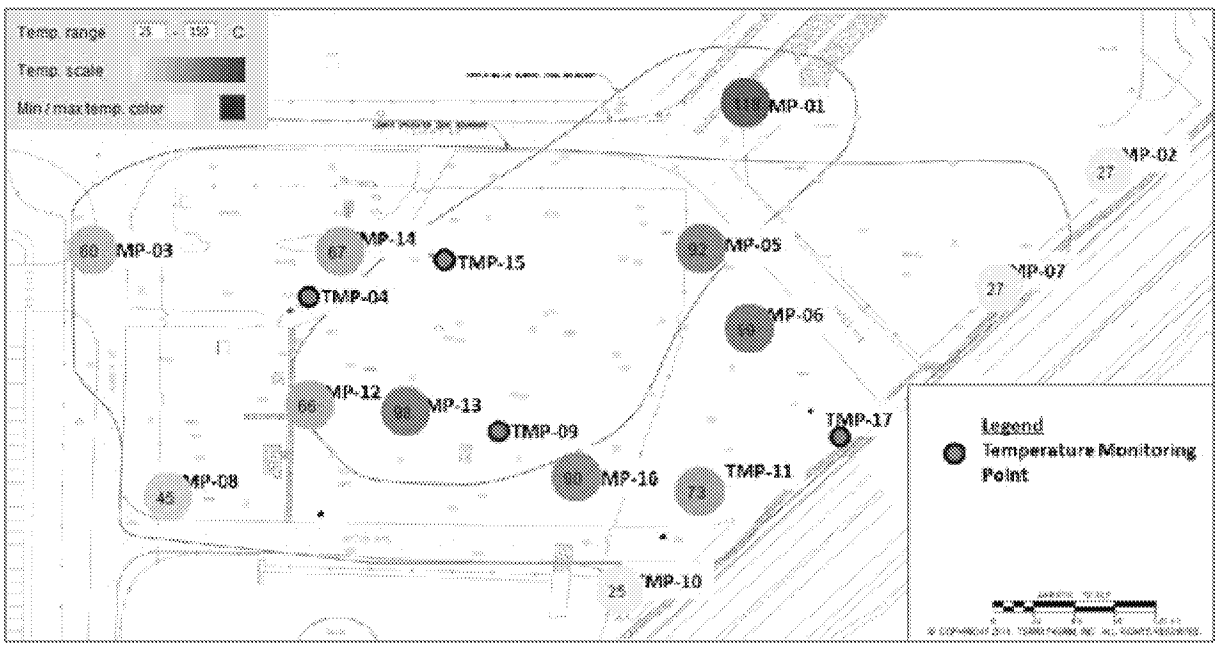

Figure 9. Horizontal Temperature Distribution across the CZ (145-160 ft bgs) (temperatures shown in °C)

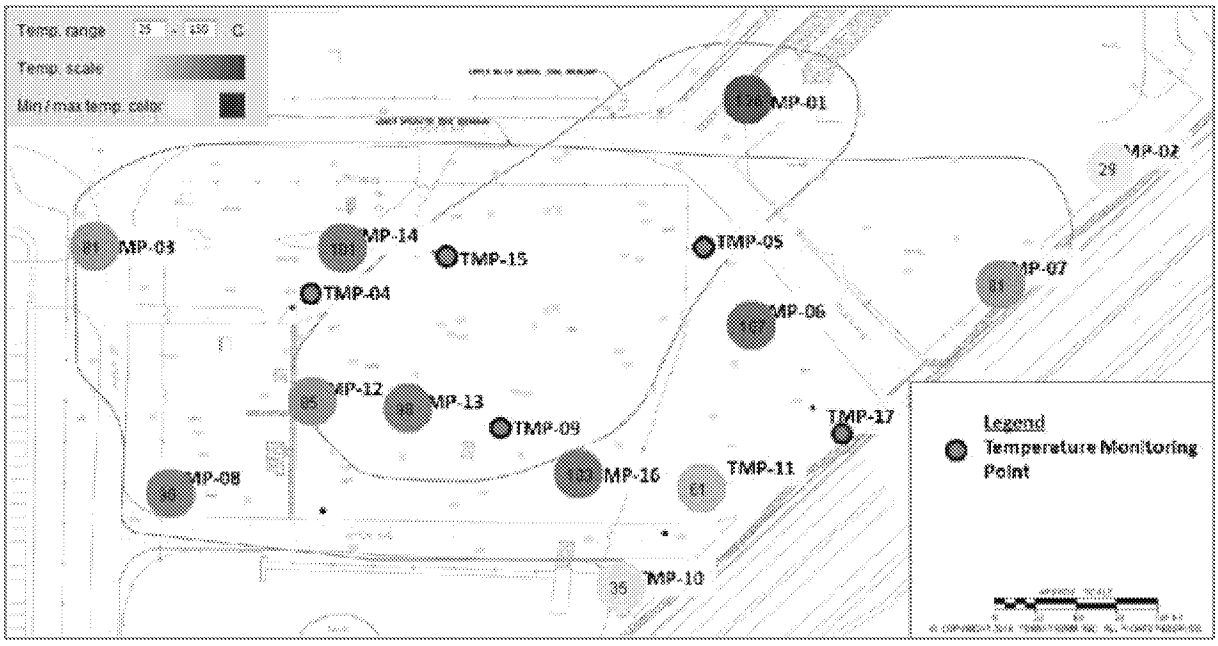

Figure 10. Horizontal Temperature Distribution across the UWBZ (161-195 ft bgs) (temperatures shown in °C)

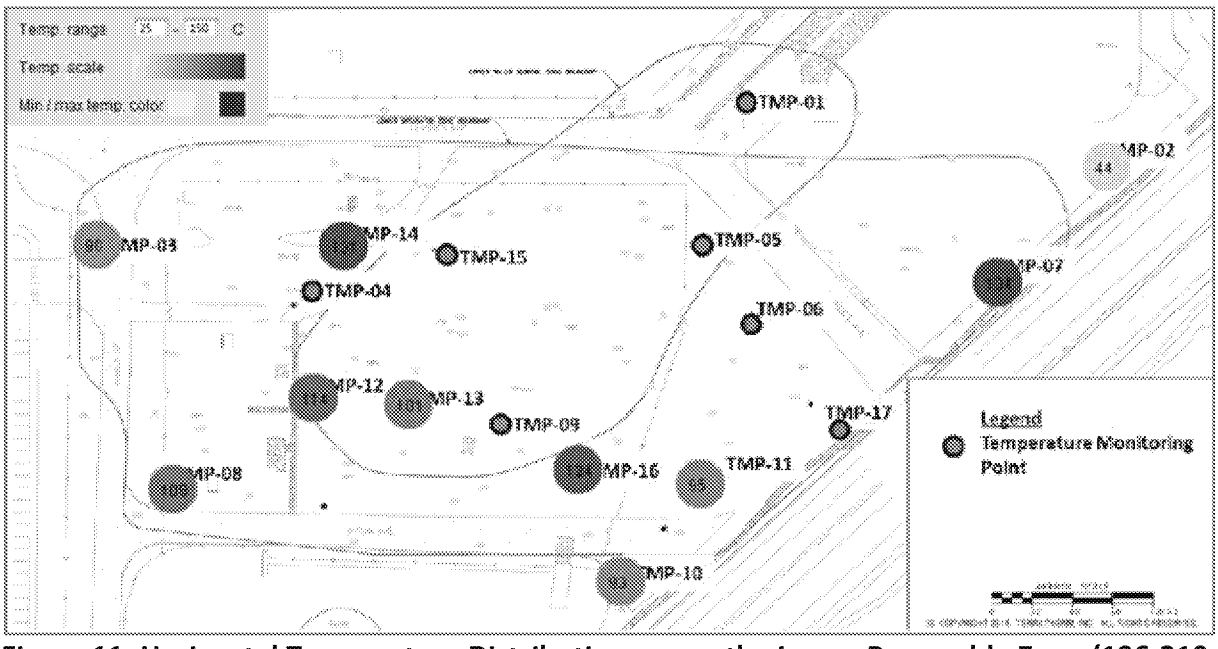

Figure 11. Horizontal Temperature Distribution across the Lower Permeable Zone (196-210 ft bgs) (temperatures shown in °C)

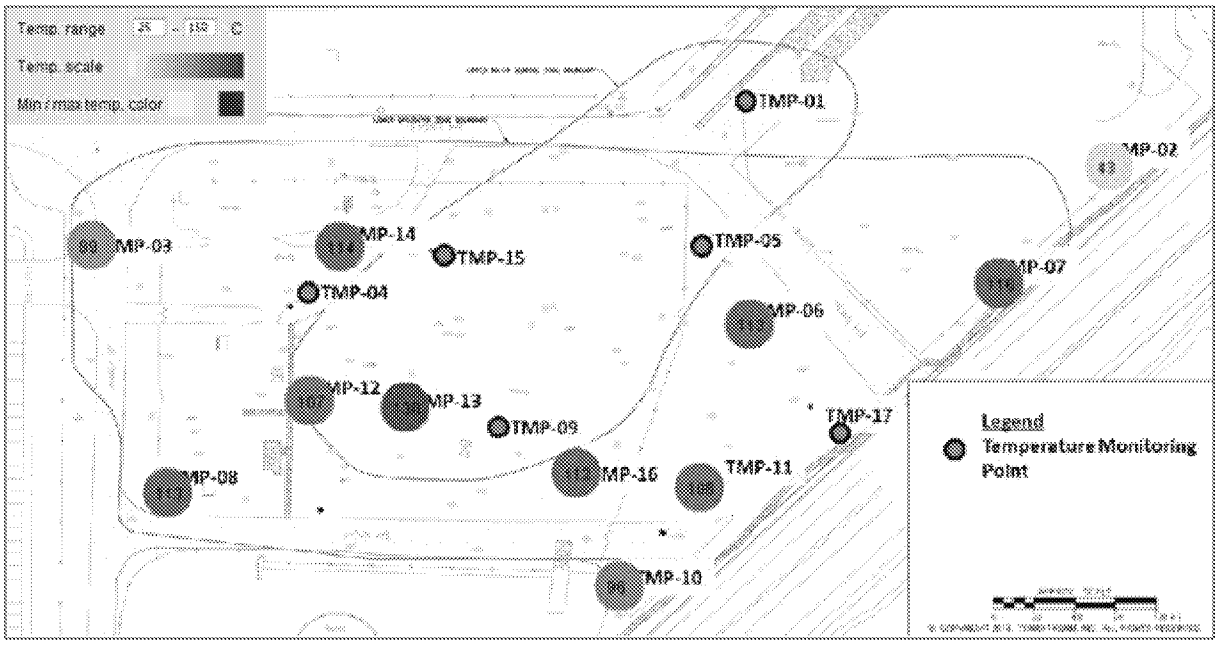

Figure 12. Horizontal Temperature Distribution across the LSZ (211-245 ft bgs) (temperatures shown in °C)

Figure 13 below shows the observed temperatures by depth at selected LSZ extraction wells.

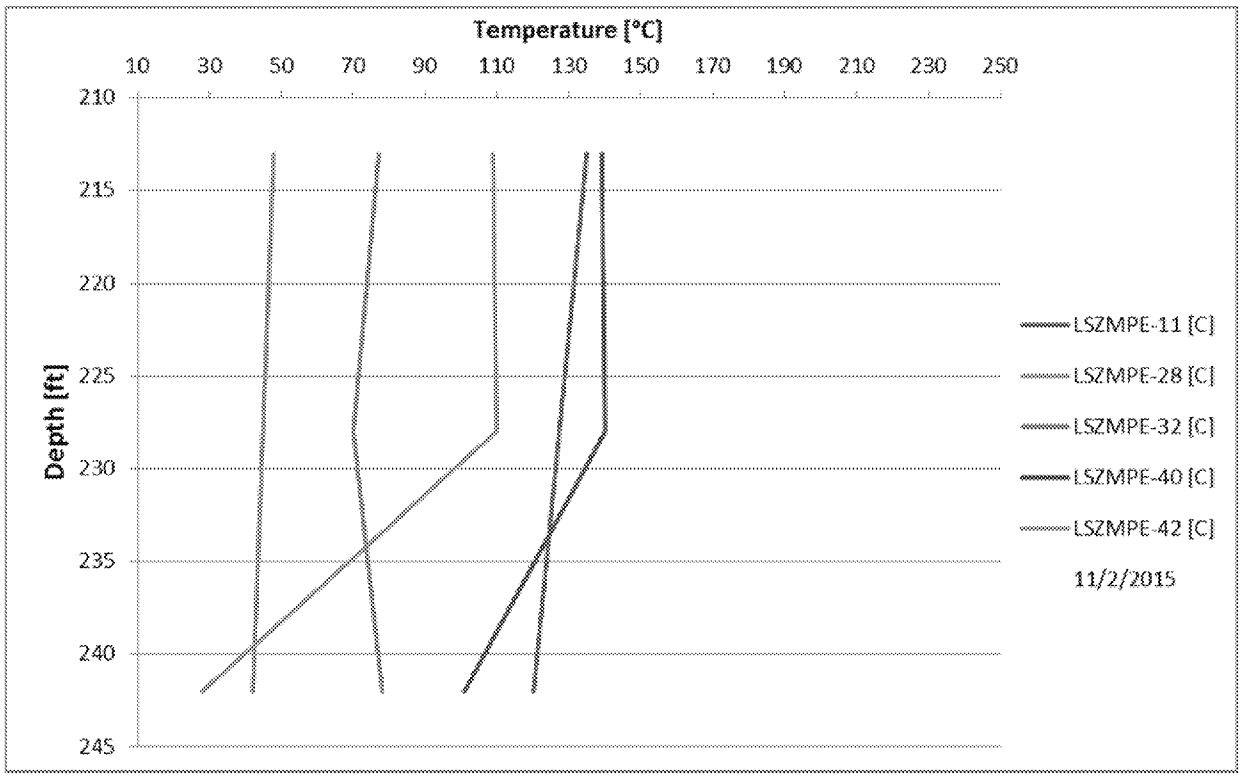

Figure 13. Temperatures by Depth at Selected LSZ Extraction Wells (211-245 ft bgs) (temperatures shown in °C)

9. Cumulative Steam Injection

Steam injection was initiated Thursday, October 16, 2014. Figure 14 below shows the cumulative steam injection for each of the three injection zones.

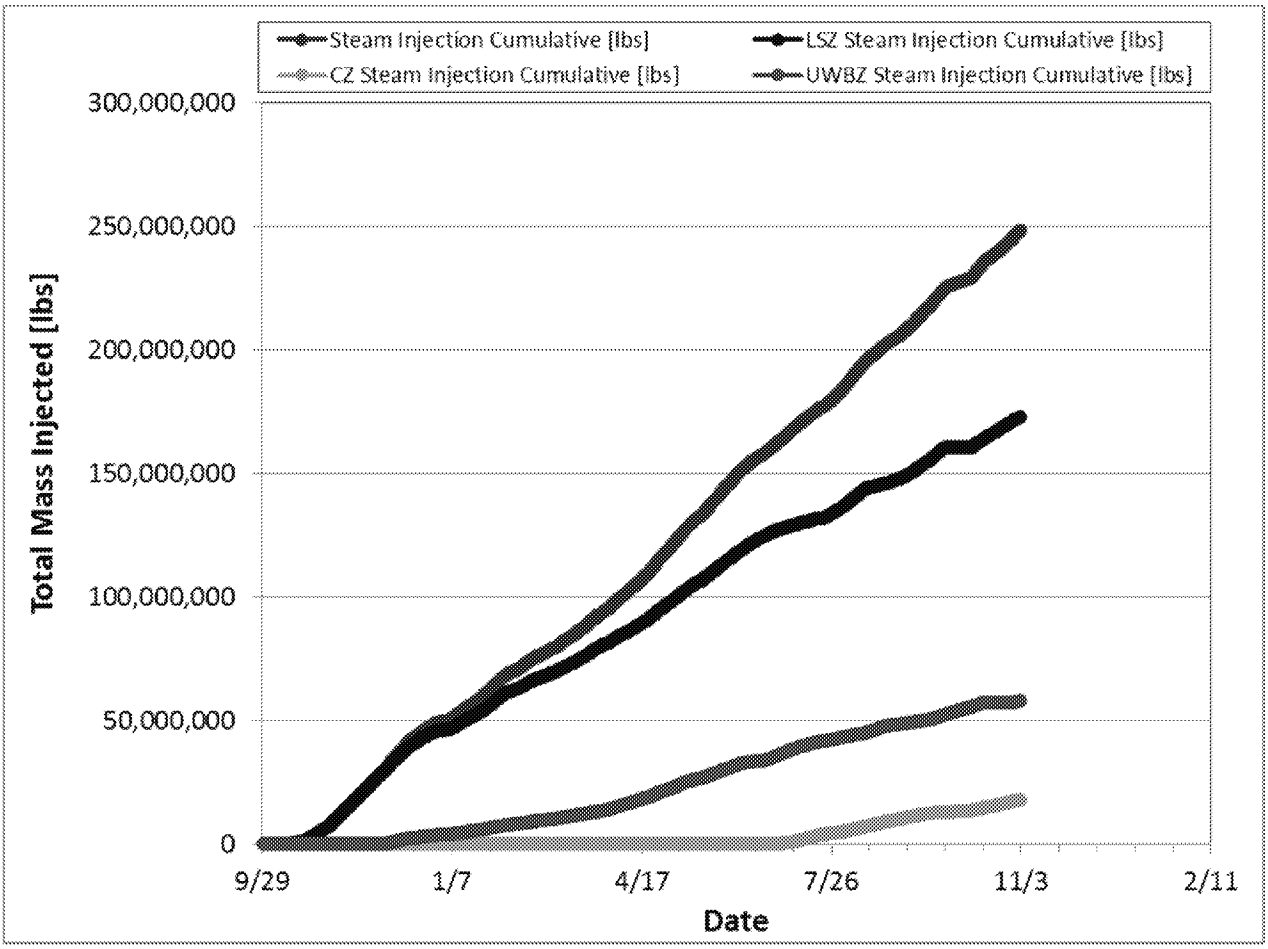

Figure 14. Cumulative Steam Injection for Each of the Three Injection Zones

10. Steam Injection Rates

The figure below shows the steam injection rates for each of the three injection zones.

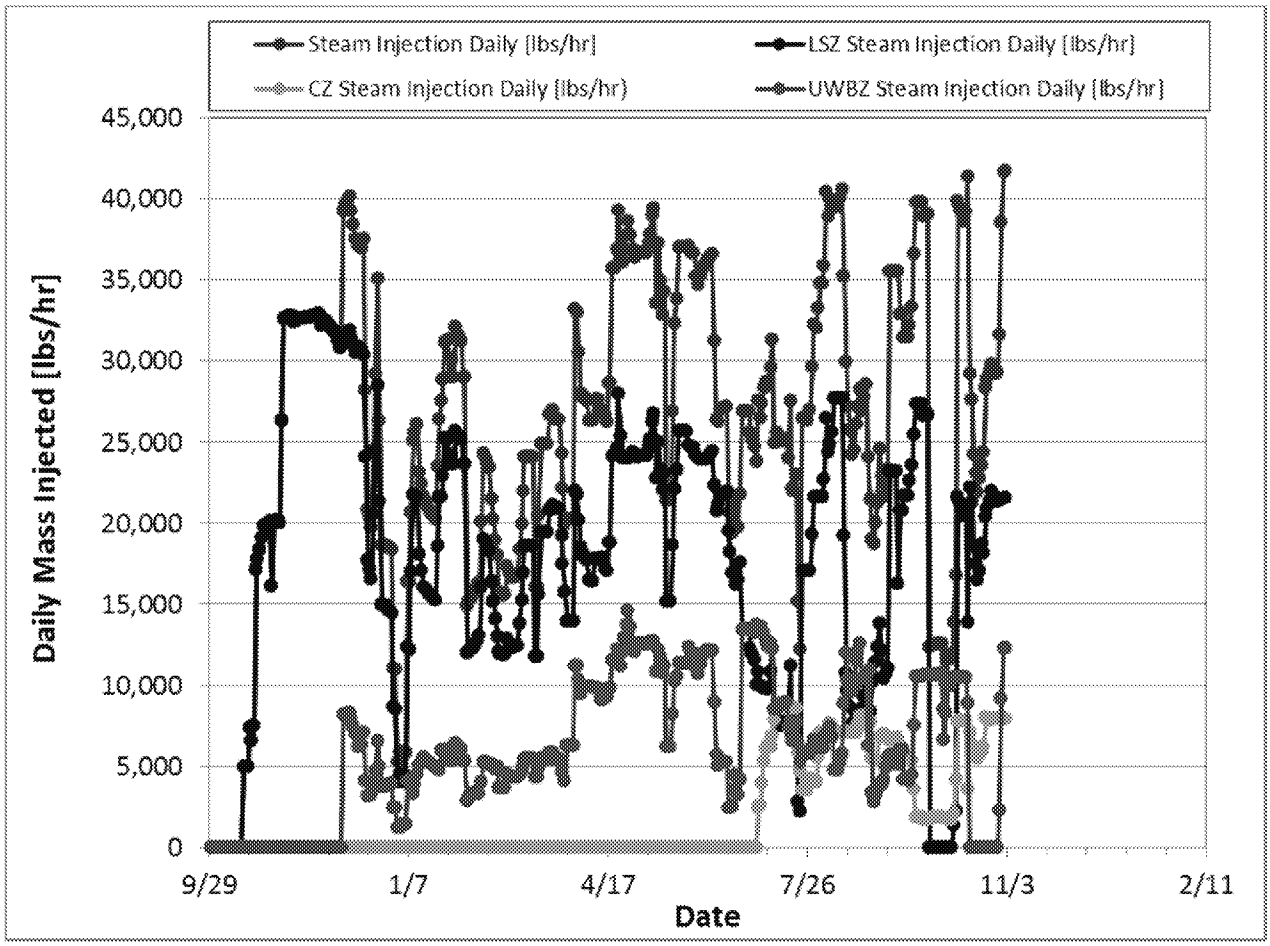

Figure 15. Steam Injection Rate for Each of the Three Injection Zones

11. Cumulative Water Extraction by Zone

The cumulative water extraction for each of the three treatment zones is shown below. The cumulative water extraction is calculated based on flow meters installed at each of the 57 extraction wells (accuracy should be considered +/- 20%). The figure below shows the net liquid extracted from the subsurface at the site and does not include the fraction of water that is recirculated to the eductor wells and used as motive water.

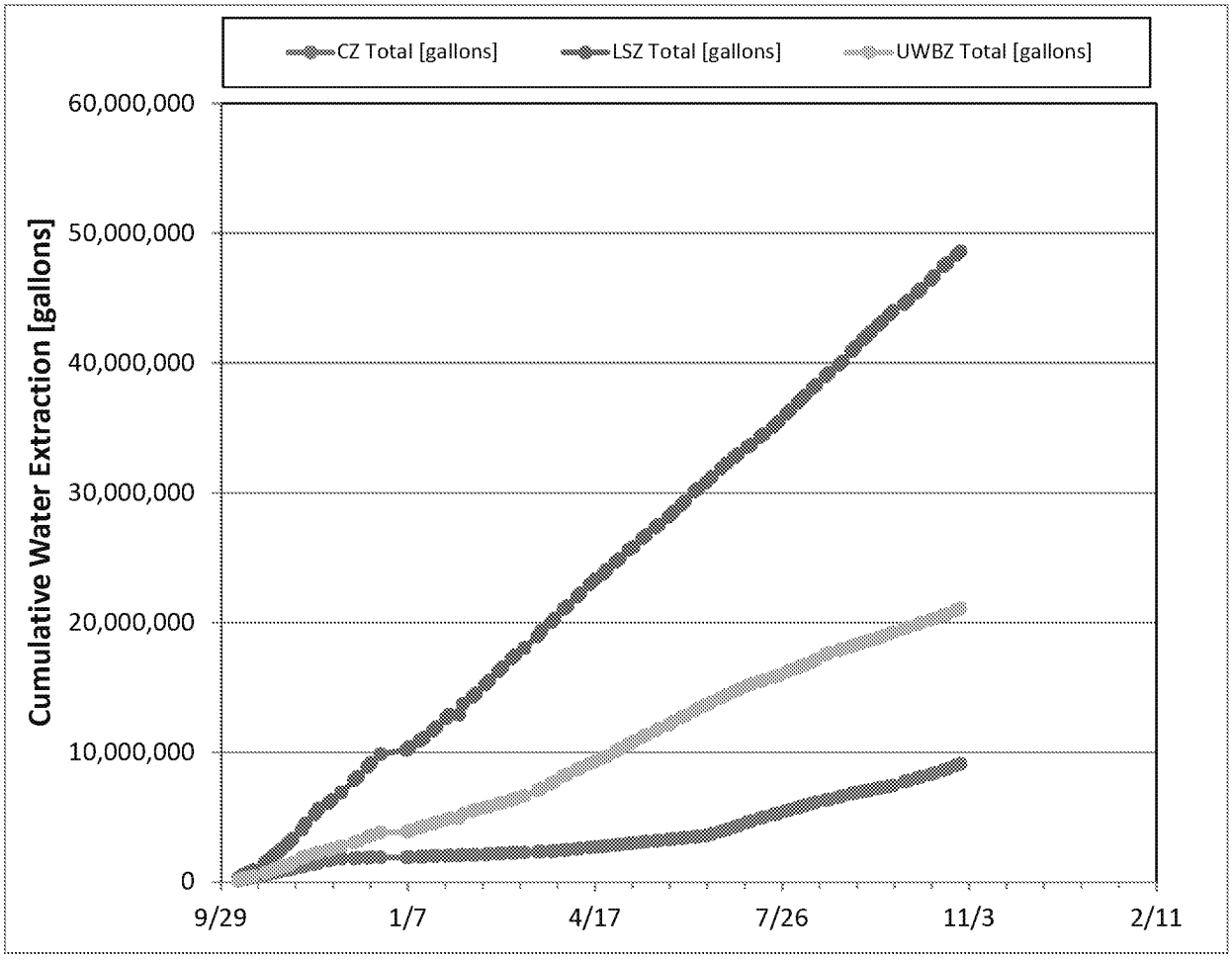

Figure 16. Cumulative Water Extraction for Each of the Three Treatment Zones

12. Water Extraction Rates by Zone

The figure below shows the water extraction rates for each of the three treatment zones.

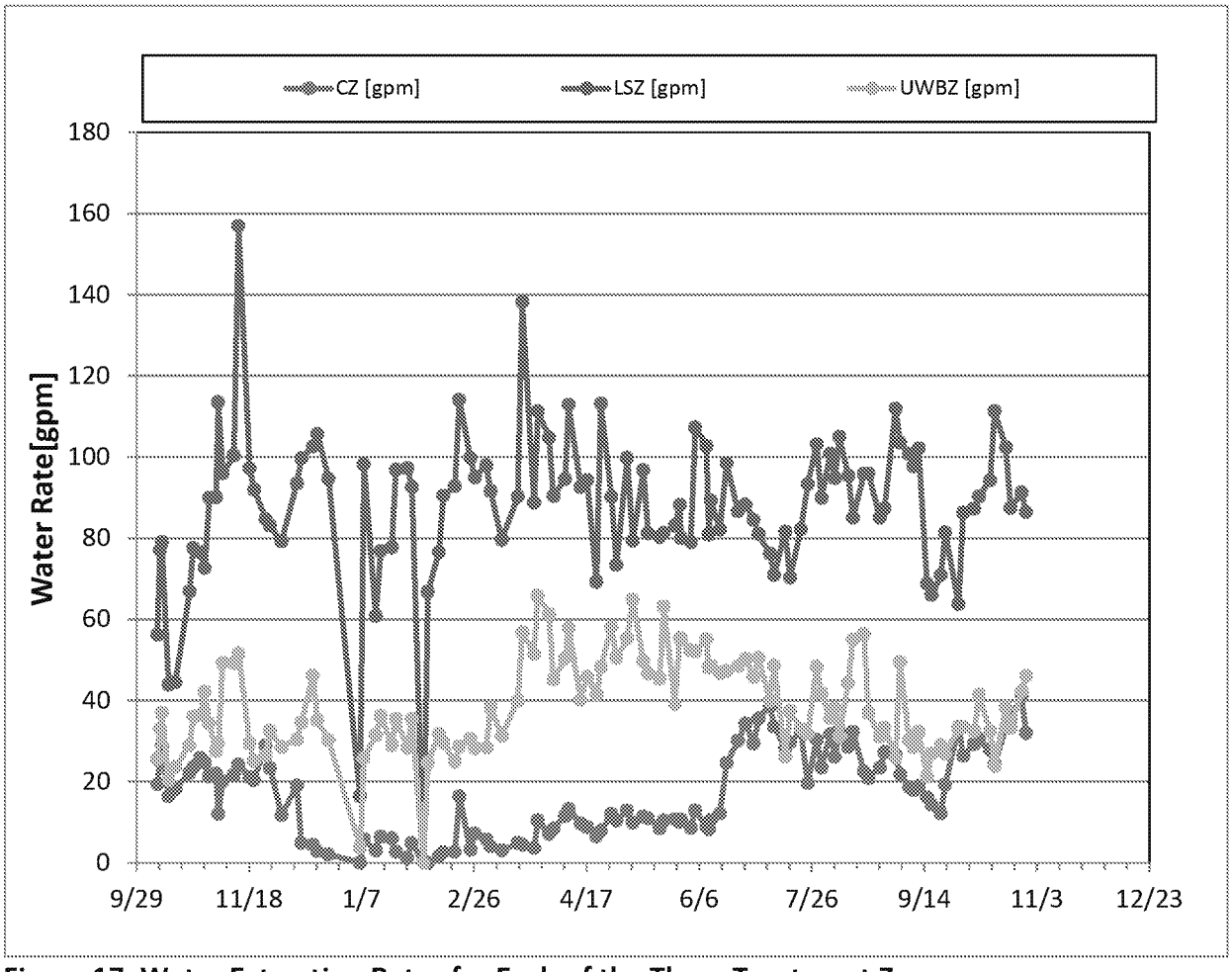

Figure 17. Water Extraction Rates for Each of the Three Treatment Zones

13. Cumulative Water Balance

The cumulative water balance for the site is shown below. The chart shows the net liquid extracted from the subsurface at the site and does not include the fraction of water that is recirculated to the eductor wells and used as motive water.

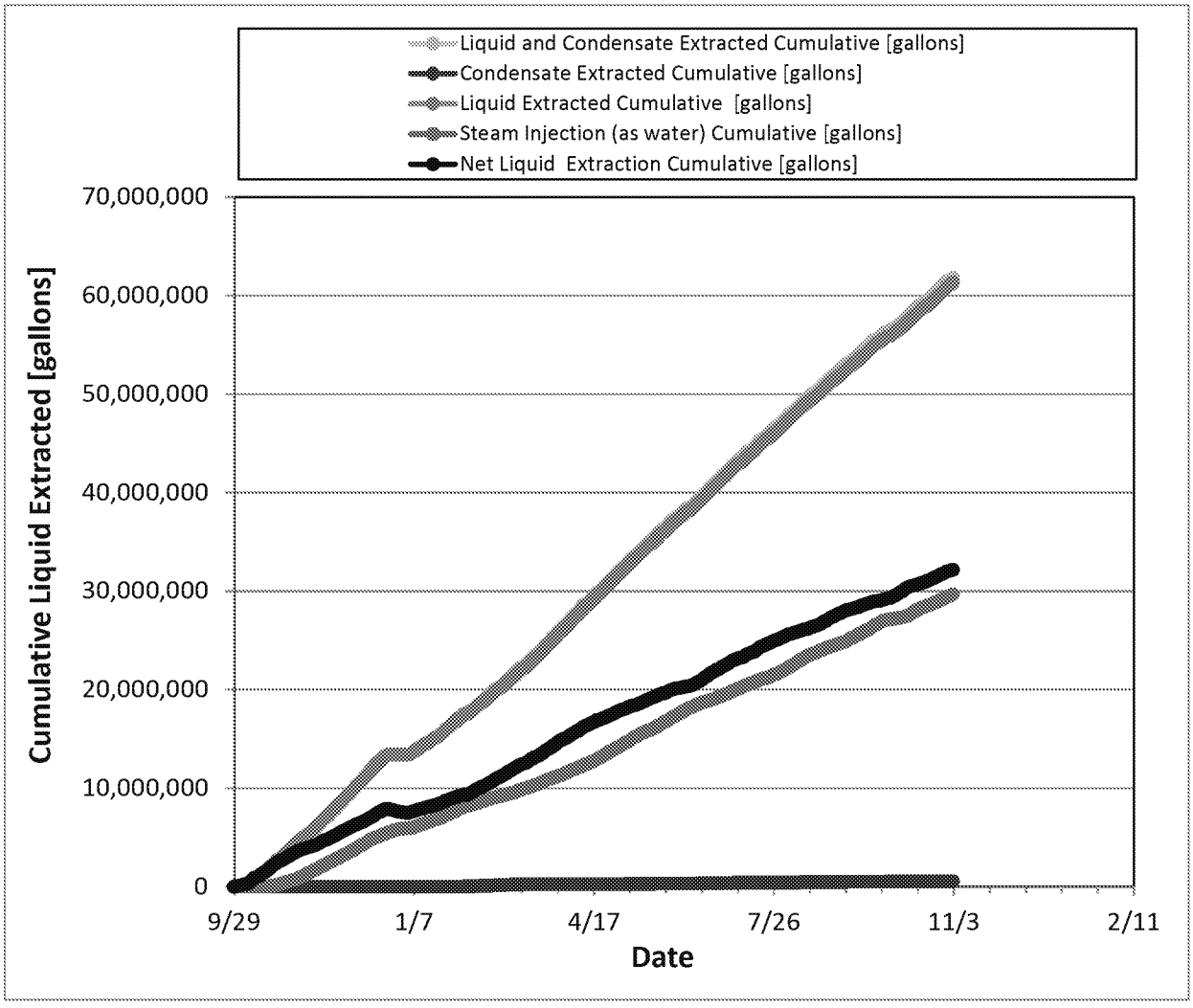

Figure 18. Cumulative Water Balance

14. Water Balance Rate

The total system water extraction rates are shown in the figure below.

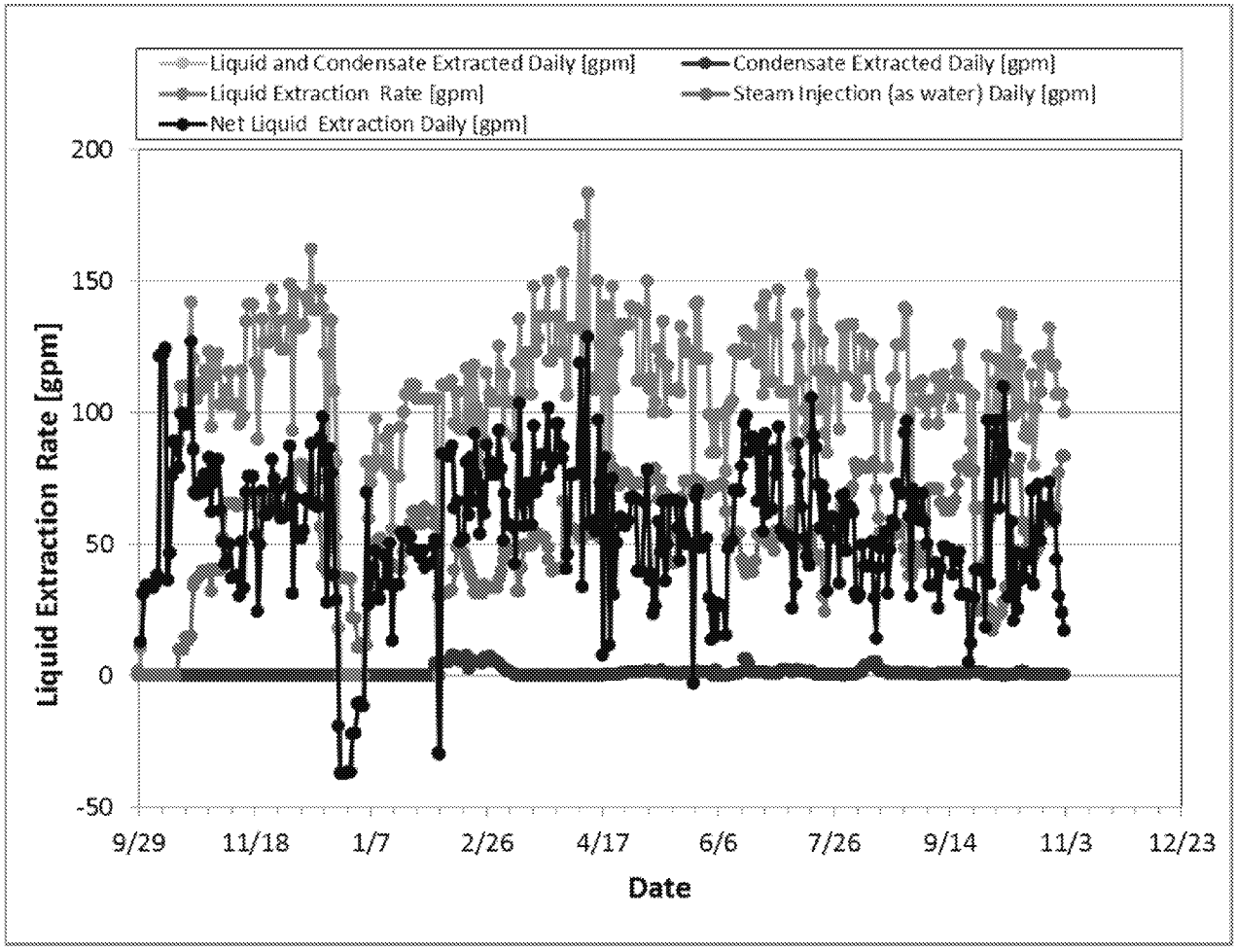

Figure 19. Water Balance Rates

15. Cumulative Energy Balance

The cumulative energy balance for the site is shown below. The energy balance has been updated to include calculated heat losses that are a combination of heat lost below the TTZ, above the TTZ and outside the TTZ. The heat losses were calculated according to the following approach:

- Based on the original SEE model, cumulative modeled heat losses were calculated for each operational phase (i.e., heat up, pressure cycling);
- The heat losses were compared to the cumulative energy added as steam for each operational phase;
- The percent of total steam energy "lost" was calculated by comparing modeled heat losses to modeled steam injection;
- Since the actual steam injection rates at ST012 have been different than originally modeled, the percent heat loss calculated for each operational phase in the model was applied to the actual steam injected to get the calculated heat losses during operation; and,
- The calculated heat losses were subtracted from the net energy injection to calculate the net energy injected with heat losses.

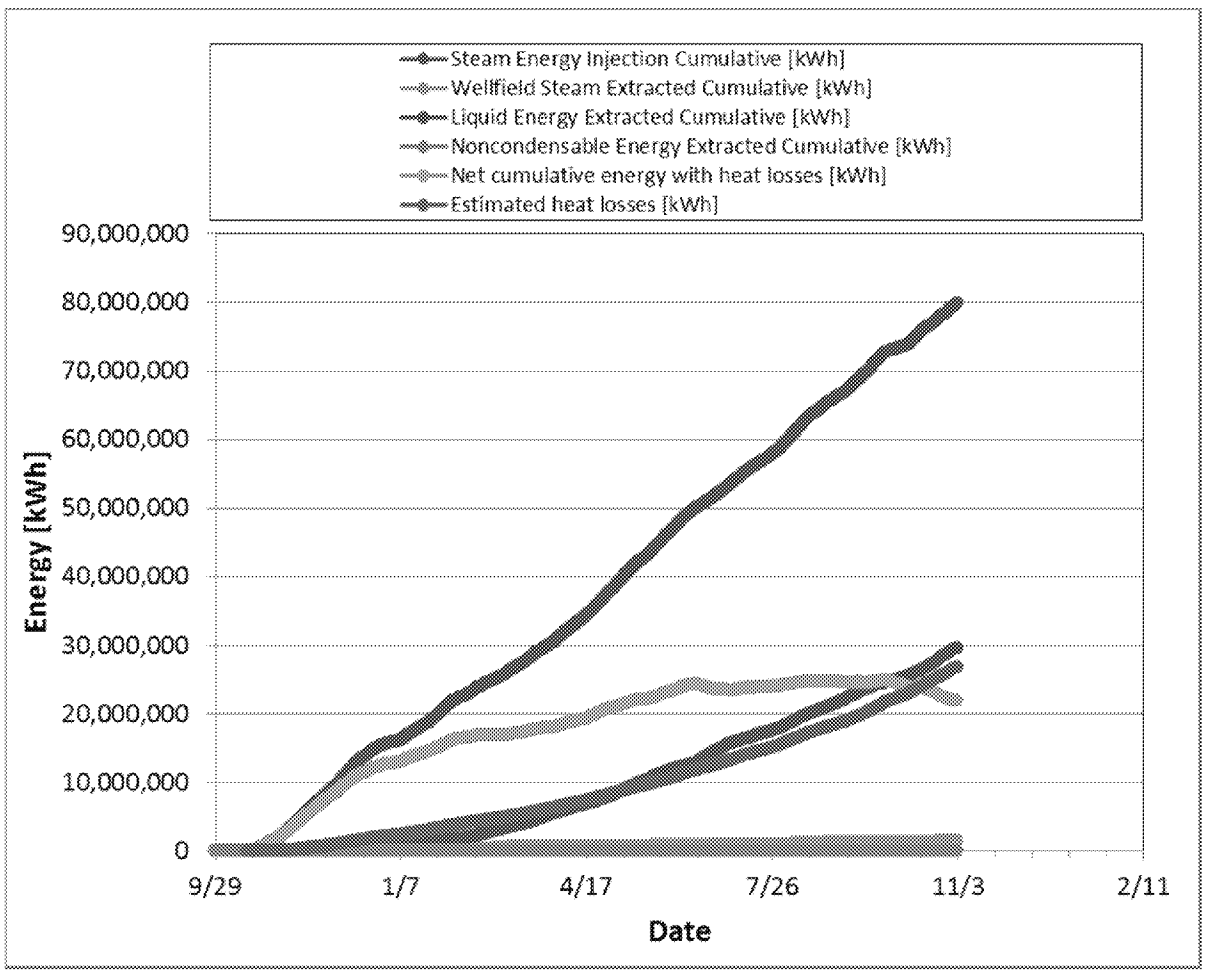

Figure 20. Cumulative Energy Balance

16. Energy Balance Rates

The energy balance rates are shown below.

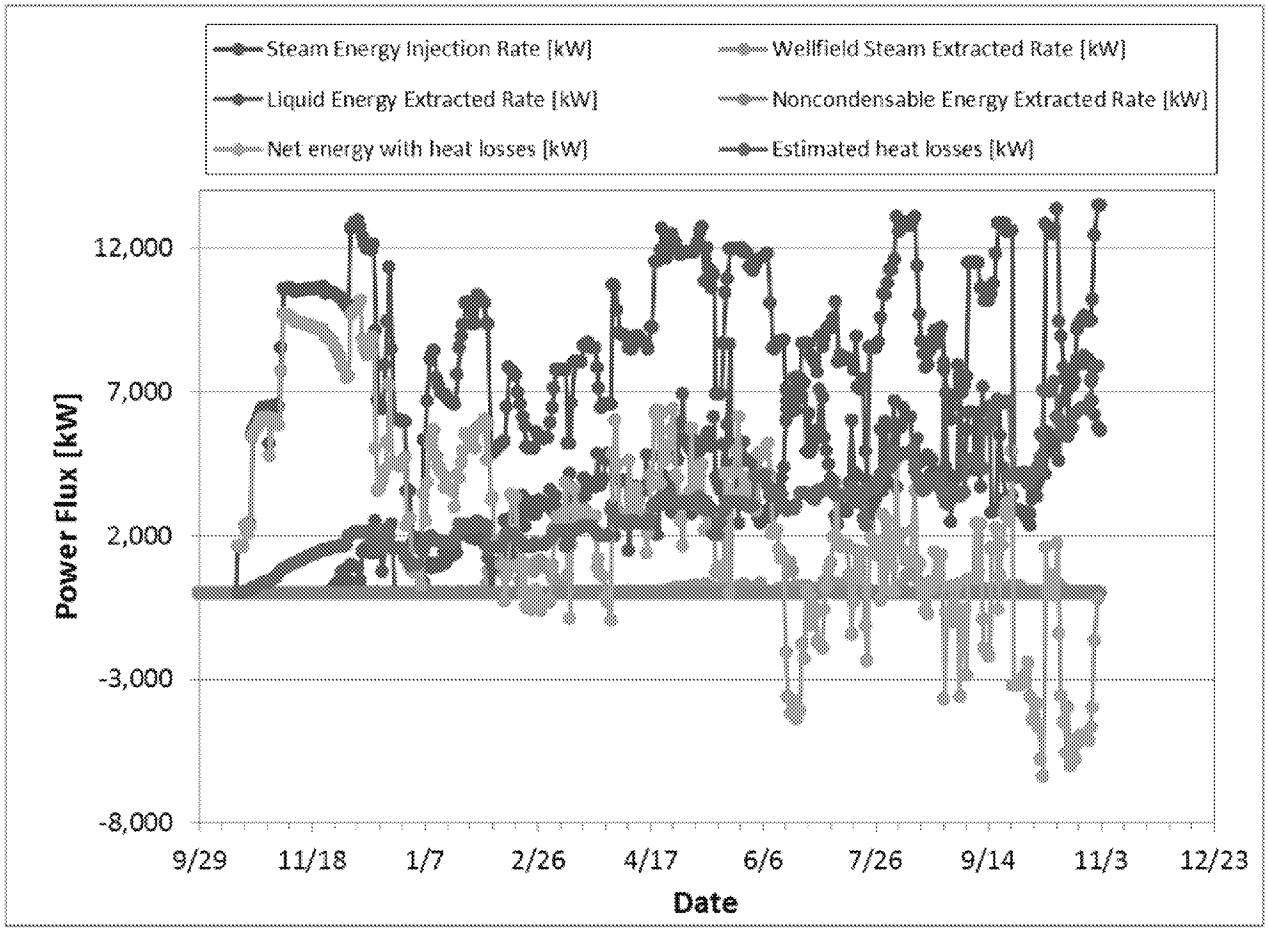

Figure 21. Energy Balance Rates

17. Perimeter Water Level Data

Table 2 below presents the change in perimeter groundwater elevations since SEE system startup. The readings collected on September 24, 2014 (not shown) represent baseline conditions. A negative number shows that the groundwater elevation is lower than the baseline elevation, thus indicating an inward hydraulic gradient into the treatment zone. Liquid extraction began on September 29, 2014. Perimeter water level data are collected on a weekly basis. The regional groundwater table at the Site is increasing at a rate of approximately 1.5 ft/year; thus, each measured value shown in Table 2 has been corrected to take the regional changes into account.

Table 2. Perimeter Groundwater Elevation Changes

	10/9/2015		10/16/2015		10/23/2015		10/30/2015	
Monitoring Well	Change from Baseline	Change from Previous	Change from Baseline	Change from Previous	Change from Baseline	Change from Previous	Change from Baseline	Change from Previous
CZ/UWBZ Wells								
ST012-C01	-1.10	-0.21	-0.98	0.15	-0.79	0.22	-0.84	-0.02
ST012-C02	-0.56	0.03	-0.41	0.18	-0.96	-0.52	-0.77	0.22
UWBZ Wells								
ST012-RB-3A	-1.42	-1.19	-1.30	0.15	-2.18	-0.85	-2.12	0.09
ST012-U02	-0.43	-0.36	-0.27	0.19	-0.81	-0.51	-0.99	-0.15
ST012-U11	-1.65	-0.63	-1.04	0.64	-1.43	-0.36	-1.27	0.19
ST012-U12	-2.33	-1.74	-1.79	0.57	-2.87	-1.05	-2.68	0.22
ST012-U37	-0.94	-0.92	-1.58	-0.61	-2.12	-0.51	-3.68	-1.53
ST012-U38	-1.32	-0.80	-1.08	0.27	-1.40	-0.29	-1.57	-0.14
LSZ Wells								
ST012-W11	-4.08	0.75	-2.21	1.90	-1.84	0.40	-1.75	0.12
ST012-W12	-3.67	2.61	-1.35	2.35	-1.55	-0.17	-1.59	-0.01
ST012-W24	-3.14	2.32	-1.43	1.74	-1.40	0.06	-1.16	0.27
ST012-W30	-3.74	2.09	-0.57	3.20	-0.94	-0.34	-1.13	-0.17
ST012-W34	-3.04	1.90	-0.91	2.16	-0.94	0.00	-0.95	0.02
ST012-W36	-2.66	2.12	0.80	3.49	-0.03	-0.80	0.05	0.11
ST012-W37	-4.10	2.14	-1.92	2.21	-1.84	0.11	-2.14	-0.27
ST012-W38	-2.95	1.48	-0.91	2.07	-0.88	0.06	-0.87	0.04

Figure 22 shows the manually collected groundwater elevation trends since system startup. Additionally Figure 23 shows the groundwater elevations continuously logged in selected perimeter wells equipped with transducers. The regional groundwater table correction has also been applied to Figure 22 below.

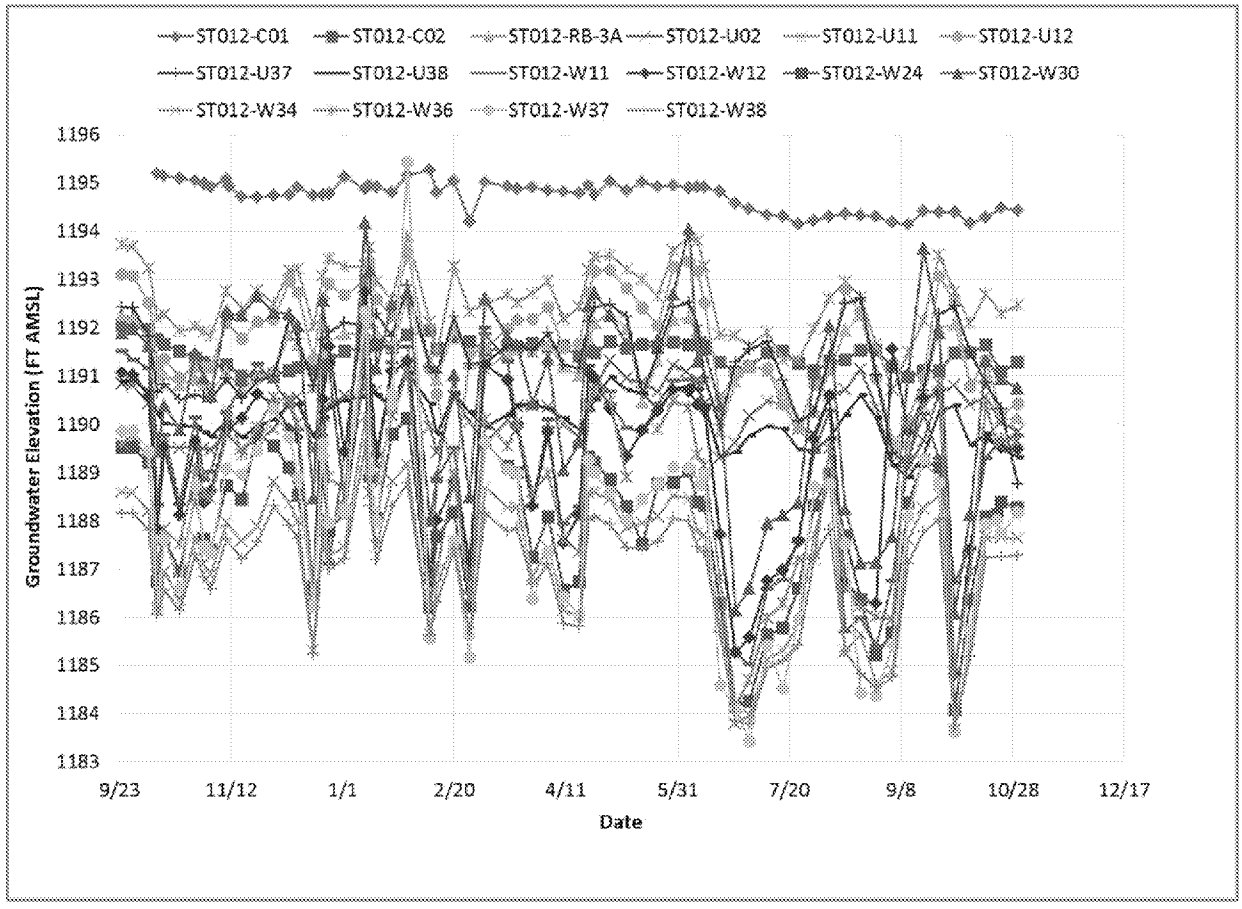

Figure 22. Manually Collected Perimeter Groundwater Elevations

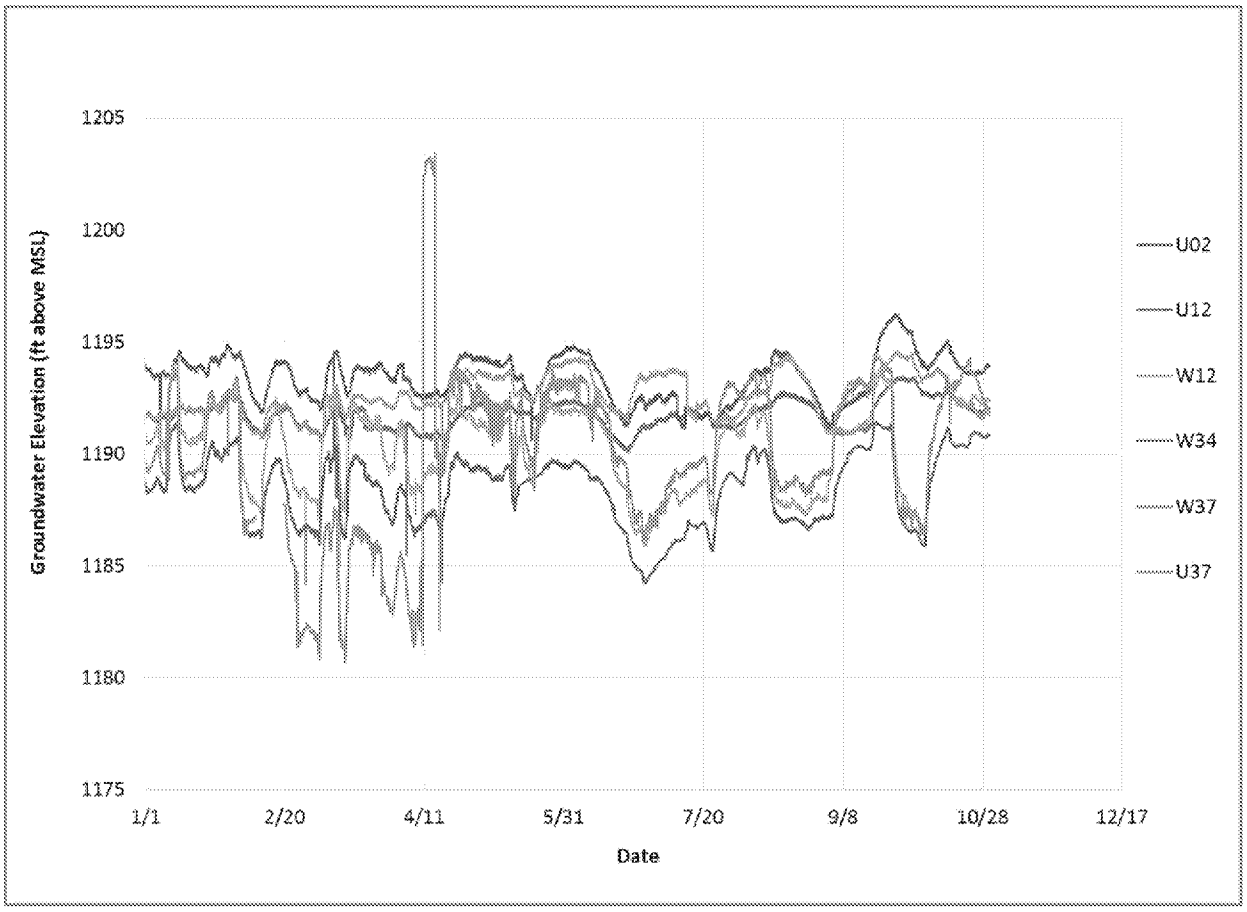

Figure 23. Automatically Collected Perimeter Groundwater Elevations

Table 3 below presents the measured LNAPL thicknesses of the perimeter wells at the site. The readings collected on September 24, 2014 represent baseline conditions while the readings collected after are during SEE operations. Perimeter LNAPL thickness data are collected on a weekly basis.

Table 3. Perimeter LNAPL Thicknesses (ft)

Monitoring Well	10/9/2015		10/16/2015		10/23/2015		10/30/2015	
CZ/UWBZ Wells	Before bailing	After Bailing	Before bailing	After Bailing	Before bailing	After Bailing	Before bailing	After Bailing
ST012-C01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-C02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UWBZ Wells								
ST012-U02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-U11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-U12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-U37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-U38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-RB-3A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LSZ Wells								
ST012-W11	14.45	8.62	4.74	4.74	9.31	0.60	31.26	0.70
ST012-W12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-W24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-W30	0.15	0.15	0.13	0.13	0.17	0.17	0.15	0.15
ST012-W34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-W36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-W37	17.48	12.62	4.10	4.10	15.68	4.80	14.55	3.31
ST012-W38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

On December 1, 2014, temperatures at selected perimeter wells were added to the monitoring program. Figure 24 below shows the manually collected temperatures recorded at the wells included in the monitoring program. Additionally Figure 25 shows the temperatures continuously logged in selected perimeter wells equipped with transducers.

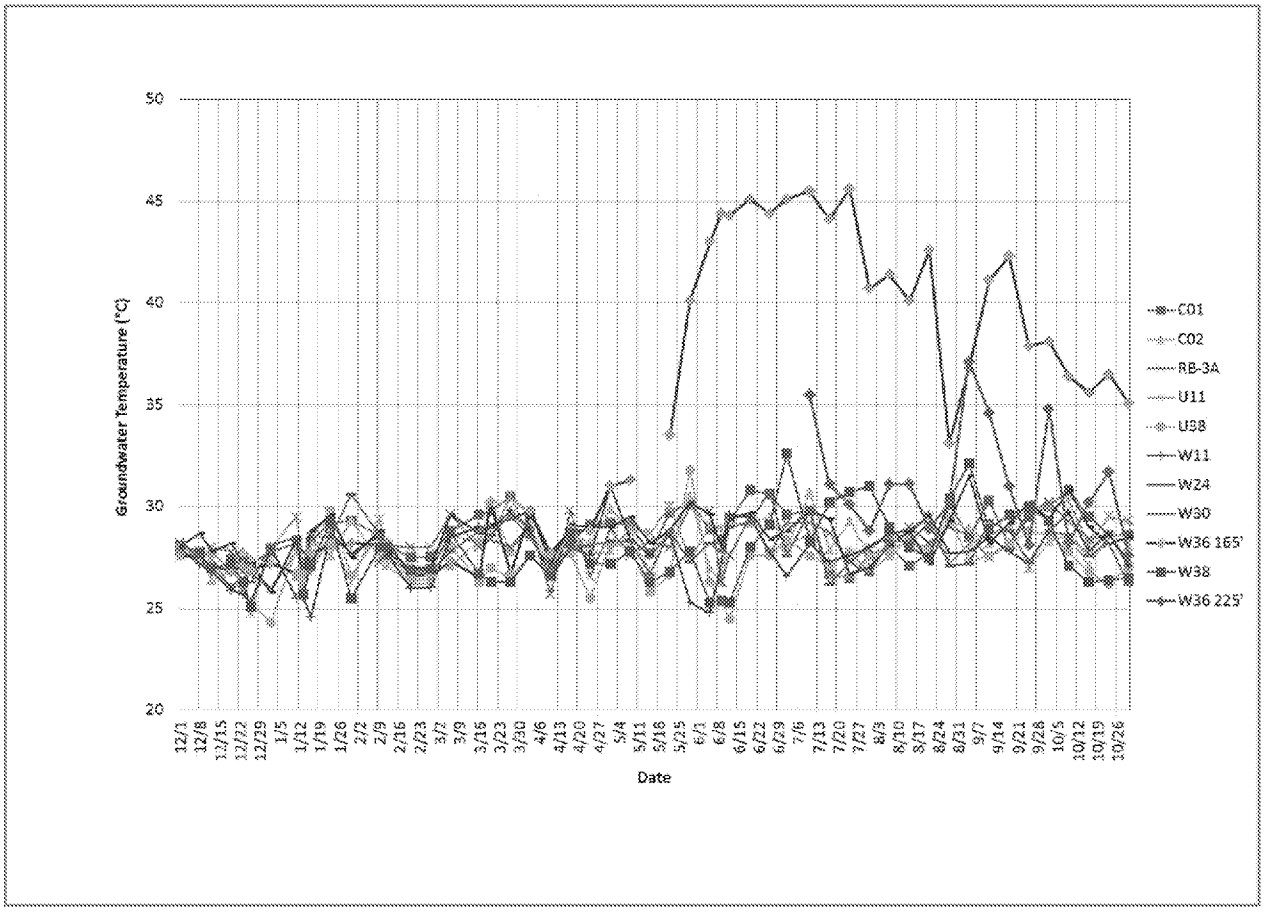

Figure 24. Manually Collected Perimeter Well Groundwater Temperatures

Note: Thermocouples are measured at approximate depths as follows (in feet below top of casing): C01=162; C02=168; RB-3A=161; U11=180; U38=164; W11=228; W24=230; W30=231; W36=225; and W38=228.

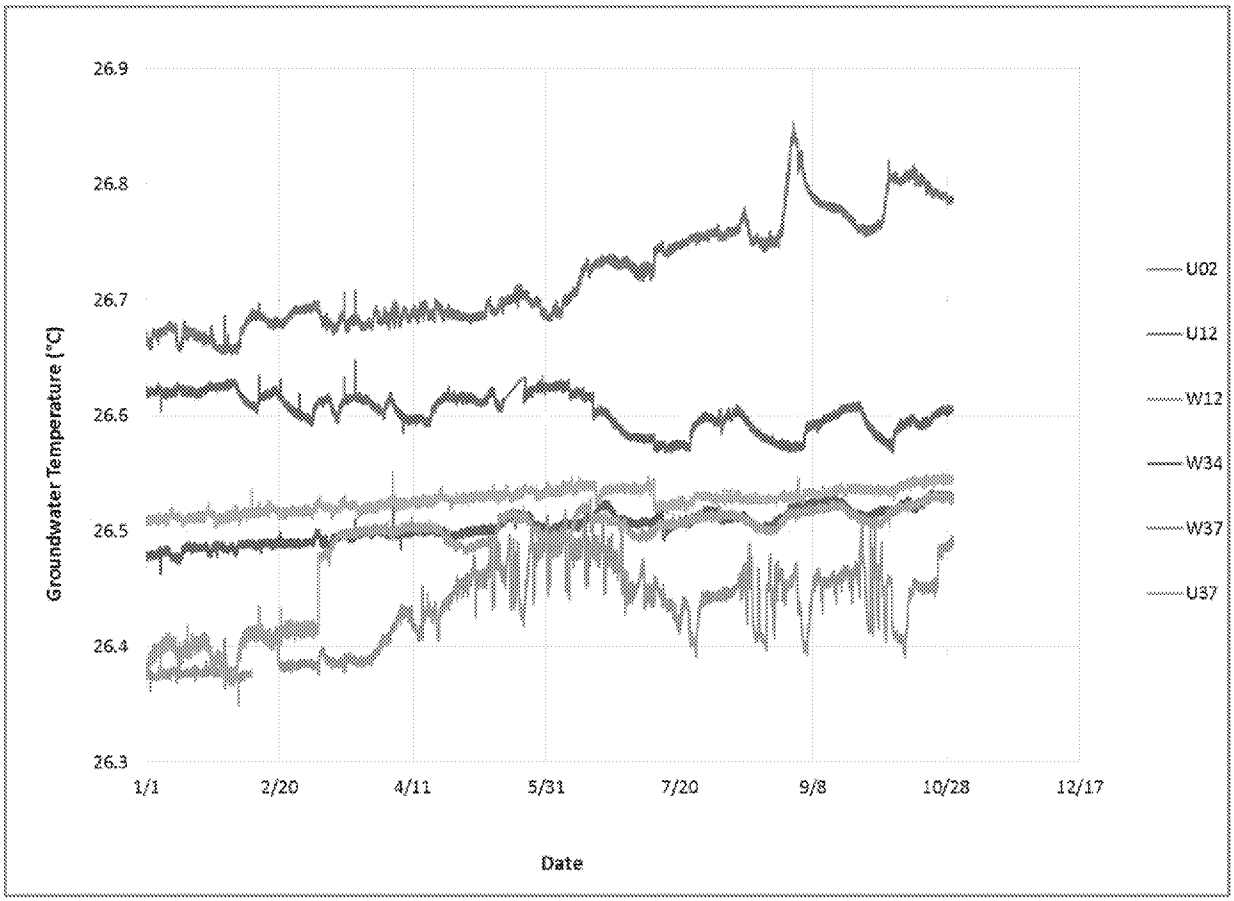

Figure 25. Automatically Collected Perimeter Well Groundwater Temperatures

Notes:
On March 7, 2015 operational personnel replaced the U37 logger unit. The increase in temperature on March 7, 2015 at U37 is a result of this replacement.

Transducers are measured at depths as follows (in feet below top of casing): U02= 175; U12= 175; U37= 182; W12= 228; W34= 225; and W37= 226.

18. Natural Gas Usage

The following figure shows the natural gas usage rate in cubic feet per hour (cf/hr) and cumulative natural gas use in cubic feet (cf) to date at the site.

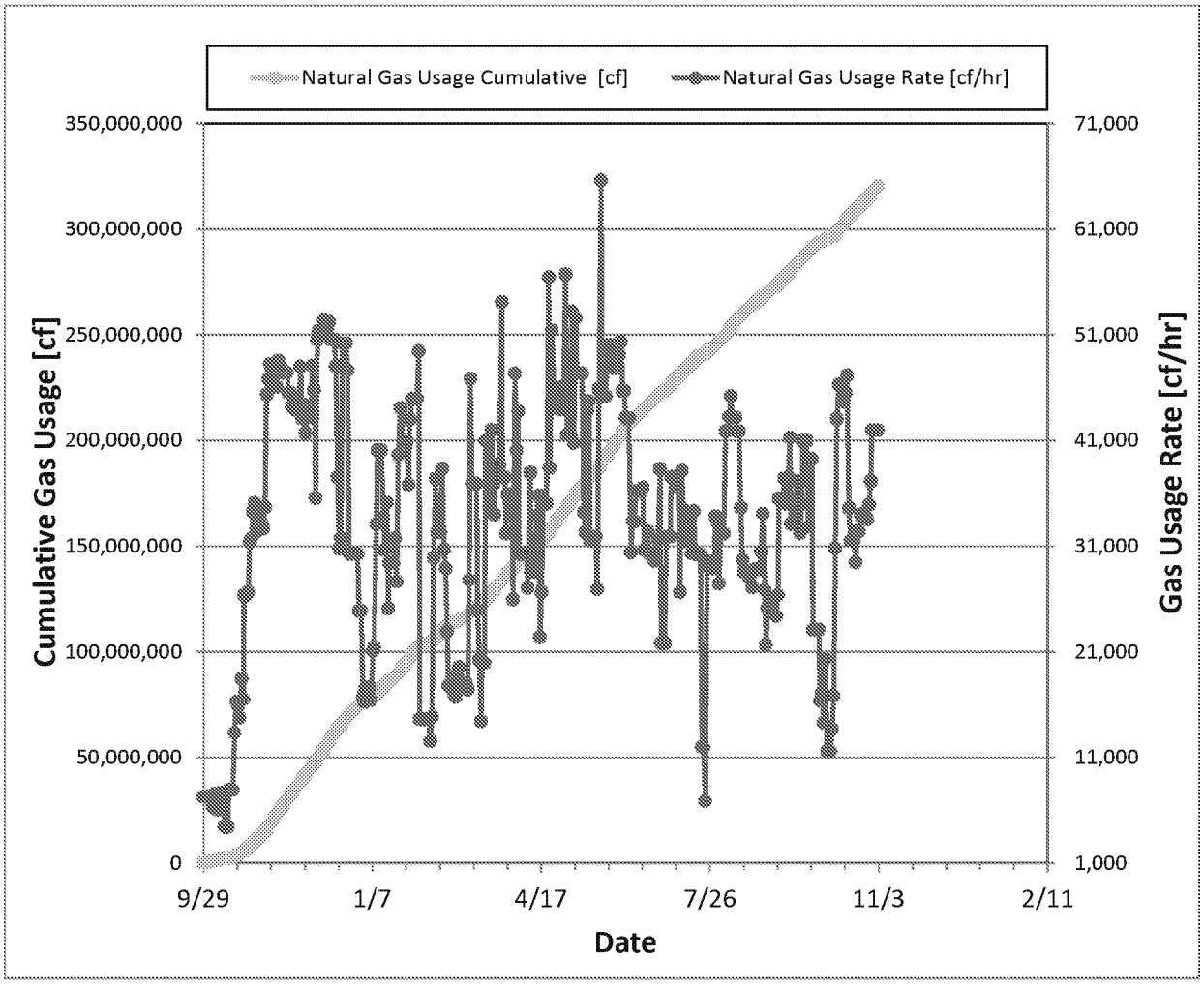

Figure 26. Natural Gas Usage

19. Waste Generation

On January 19, 2015 a total of 8,033 gallons of material from tank cleanout activities was removed from the site by Mesa Oil for recycling. The mass of JP-4 in the material was estimated to be 2,857 gallons or 18,800 lbs.

On February 18 and 19, 2015 a total of 24,430 gallons of material from tank cleanout activities was removed from the site by Mesa Oil for recycling. The mass of JP-4 in the material was estimated to be 3,645 gallons or 23,984 lbs.

On March 12, 2015 a total of 11,359 gallons of predominantly water from tank cleanout activities was removed from the site by Mesa Oil for recycling. The JP-4 mass in the water was limited.

On March 20, 2015 the first shipment of bag filters (four cubic yard boxes) from the SEE process treatment system was shipped offsite for non-hazardous disposal.

On March 30 and 31, 2015 a total of 32,000 lbs of spent liquid carbon was removed from the site by Evoqua Water Technologies for regeneration at their Red Bluff, CA facility.

On April 24, 2015 a shipment of bag filters (three cubic yard boxes) from the SEE process treatment system was shipped offsite for non-hazardous disposal.

On May 29, 2015 a shipment of bag filters (four cubic yard boxes) from the SEE process treatment system was shipped offsite for non-hazardous disposal.

On June 11, 2015 three 55-gallon drums of soil dug from around the Hypro NAPL filter were shipped offsite for non-hazardous disposal.

On June 10, 2015 a total of 5,727 gallons of oily bio-impacted water from tank cleanout activities was removed from the site by Mesa Oil for recycling.

On June 25, 2015 a shipment of bag filters (four cubic yard boxes) from the SEE process treatment system was shipped offsite for non-hazardous disposal.

On August 19, 2015 a total of 16,000 lbs of spent liquid carbon was removed from the site by Evoqua Water Technologies for regeneration at their Red Bluff, CA facility.

On August 27, 2015 a total of five totes with approximately 250 gallons each of water/solids from disinfection of the liquid carbon vessel were removed from the site by MP Environmental for disposal.

On October 22, 2015 a shipment of bag filters (four cubic yard boxes) from the SEE process treatment system was shipped offsite for non-hazardous disposal.

20. NAPL Reuse

On April 7, 2015 a total of 12,647 gallons of stored NAPL was sent to Mesa Oil for reuse. The analysis showed that 703 gallons of the total fluid was water. The water has been subtracted from the NAPL recovery estimate.

On April 21-22, 2015 a total of 13,076 gallons of stored NAPL was sent to Mesa Oil for reuse. Analysis showed a water content between <1% to 3% or a total of 227 gallons of water. The water removed has been subtracted from the NAPL recovery estimate.

On May 7, 2015 a total of 5,722 gallons of stored NAPL was sent to Mesa Oil for reuse.

On May 21, 2015 a total of 1,400 gallons of stored NAPL was sent to Mesa Oil for reuse.

On June 24, 2015 a total of 6,771 gallons of stored NAPL was sent to Mesa Oil for reuse.

21. Estimated Formation Water Temperature

The estimated formation water temperatures are indicated in Table 4 below. The formation water temperatures have been estimated for each MPE well by measuring the eductor liquid feed and return flow rate together with the eductor liquid feed and return temperatures. The enthalpy increase in the liquid return temperature as compared to the liquid feed stream temperature is used to provide the MPE well specific formation temperature. Estimated formation water temperatures above the boiling point likely indicate that steam is being pulled into the liquid extraction system. These estimated data for each MPE well location are used in conjunction with the extracted vapor data collected at the MPE wells to make determinations on steam breakthrough around the site. All of these data are reviewed holistically (with other site data such as the TMP data) to determine when and where steam cycling events should commence.

The location of each MPE well is also indicated in the table. Since perimeter extraction wells are expected to extract colder water from outside of the treatment zone, the formation temperature at these locations is not expected to reach steam temperatures. Thus, full or partial steam breakthrough can still be occurring at the perimeter locations without the estimated formation water temperature being at boiling. Please note that if the estimated formation water temperature is higher than 220°C for a given well, ">220" is indicated in the table.

Lastly, vapor extraction temperatures have been entered for MPE wells not currently pumping. Vapor temperatures are used to identify if the location is at steam temperature.

Table 4. Estimated Well Formation Temperatures

Well	Well	Required to Reach	Reached Steam	Vapor Extraction	Formation Temperatures																										
					8/3/15	8/5/15	8/7/15	8/11/15	8/13/15	8/18/15	8/20/15	8/25/15	8/27/15	9/1/15	9/3/15	9/7/15	9/9/15	9/11/15	9/15/15	9/17/15	9/21/15	9/23/15	9/29/15	10/1/15	10/6/15	10/8/15	10/13/15	10/15/15	10/20/15	10/22/15	10/27/15	10/29/15
	Location	Steam Temperature	Temperature (Calculated)	Max Temperature [°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]
CZ07	Perimeter	No	No	131	106	141		127		143	138	161	162	149	163		159		152		137		167	155	126	191		166	191	210	>220	211
CZ08	Perimeter	No	No	138	125	116		125		126	129	159	137		173		195		199		189		91	147	153	156		173		175	174	183
CZ09	Perimeter	No	No	105	113	117	121	118	120	107	115	110	117	130	109	132	98	139	104	103	96	138	139	159	120	124	138	144	109	120	111	112
CZ10	Perimeter	No	Yes	206	123	131		129		142	147	166	135		195		213		174		175		133	151	114	>220			65	120	123	
CZ11	Interior	Yes	Yes	212																						212	>220	>220	>220	>220	>220
CZ12	Perimeter	No	Yes	105	120	116	123	114	133	111	124	132	125	151	143	117	140	156	116	162	157	150	141	144	130		121			162	162	173
CZ13	Perimeter	No	Yes	160	157	151		176		161		149	158		160		167		168		>220		138	122	145	135			166	168	169	175
CZ14	Perimeter	No	Yes	112	123	>220	199	177	>220	212	217	>220	>220	191	136	185	>220	>220	211	198	>220	>220	>220	>220	>220	212	>220	>220	>220	>220	>220	>220
CZ15	Interior	Yes	Yes	120	>220		172	163	214		>220	219	>220	>220	133	200	>220	192		195	>220	195	98	122	121	157	113	105	200	207	>220	182
CZ16	Perimeter	No	Yes	178	170	>220	210	>220	>220	>220	>220	>220	>220	>220	>220	>220	>220	>220	198	>220	96	>220	132	158	132	176	>220	>220	>220	>220	>220	>220
CZ17	Perimeter	No	Yes	200	138	92	95	104	119	116	0	99	99		175	131	140	155	156	>220	181	136	133	148	134	144	167	186	210	210	164	189
CZ18	Perimeter	No	No	100	94	88	100	99		102	138	104	102		108	119		134	104	126		126		126	105	122	134	103	160	133	150	158
CZ19	Perimeter	No	No	110	91		95	110	103		107	136	137		150	139	148	128		148	115	145	134	135	135	141	152	107	181	171	169	205
CZ20	Outside CZ	No	No	111	100	89	100	99		99	109	89	94	96	91	95		101	83	92		99		97	91	100	96	98	96	95	93	90
LSZ01	Interior	Yes	Yes	126	191	192	180	153	200	>220	148	107	107	130	184	157	183	182	113	132	174	194	194	193	186	201	189	182	193	196	>220	199
LSZ02	Interior	Yes	Yes	130			186	186	101				117	166	189	74				>220	>220	>220	>220	191	29		213	>220	89			
LZS04	Interior	Yes	Yes	206																				93								
LSZ05	Interior	Yes	Yes	220	>220		>220	>220	>220		150	>220		75	80	213	>220	>220	>220	76	85	>220										
LSZ06	Interior	Yes	Yes	218	>220	>220	>220	>220	>220	205	204	188	198	>220	187	191	217	216	>220	>220	96	>220	>220	>220	>220	>220	>220	>220	204	>220	>220	>220
LSZ08	Perimeter	No	Yes	120	199	>220		129		205	207	196	>220	209	205		202		107		>220		144	212	>220	208		179	>220	>220	>220	>220
LSZ11	Perimeter	No	Yes	119		>220		>220	>220		>220	>220	>220	99	0	>220	>220			0	104					144	121	137	129	119	123	121
LSZ12	Perimeter	No	No	126	177	181	189	191	190	178	163	168	168	159	172	174	175	165	171	183	168	192	192	170	168	170	175	190	186	186	187	188
LSZ13	Interior	Yes	Yes	125	203	216	203	206	212	194	0	199	203		189	190	201	158	179	198	220	199	205	218	196	206	218	>220	209	216	210	215
LSZ14	Perimeter	No	No	125	192	185	195	190	193	183	174	176	177	161	165	172	180	186	185	185	190	196	185	169	164	162	172	183	191	183	194	202
LSZ15	Interior	Yes	Yes	208	>220	>220	>220	>220		>220	125	209	207	195	>220	>220		>220	>220	>220		>220		212	205	196	220	>220	219	>220		
LSZ16	Interior	Yes	Yes	205	158		162	173			169	163	>220	157	158	182	186	191		176	107	200	160	160	152	160	170	208	193	181	187	190
LSZ17	Perimeter	No	Yes	223											140		165		98		172		120	119	109	109			129	127	119	116
LSZ28	Perimeter	No	Yes	129	193	209		>220		0	188	171	184		164		178		177		185		0	167	150	156		174	185	184	187	190
LSZ29	Perimeter	No	No	116	167	190	161	104	170	190	0	175	186		166	155	167	169	59	195	179	190	187	184	176	189	198	185	171	186	191	206
LSZ30	Interior	Yes	Yes	133	217	>220	219	211		209	213	189	210	212	201	211		217	215	215		214		>220	196	203	218	>220	>220	>220	131	>220
LSZ31	Interior	Yes	Yes	147	214	>220	>220	>220	>220	200	215	208	197		97	173	186	187	176	188	202	208	191	175	184	>220	>220	>220	>220	>220		189
LSZ32	Interior	Yes	Yes	120	>220	217	201	209	219	202	0	201	213		187	175	197	195	208	163	206	195	215	202	178	192	211	213	214	>220	217	>220
LSZ33	Perimeter	No	Yes	130	193	199	200	>220	207	195	191	193	199	179	184	179	185	182	165	192	166	198	192	192	188	183	186	192	195	193	197	201
LSZ34	Interior	Yes	Yes	128	190	205	200	213					118		113	162	192	127	121	124	192	207	120	171	203	187	142	132	146	197	202	215
LSZ35	Perimeter	No	Yes	121		124	143	135	145	204	127	168	>220	202	119	114	119	130	117	116	107	133	124	127	124	124	125	124	120	127	131	126
LSZ36	Perimeter	No	Yes	128	175	183	196	194	202	195	190	183	182	177	177	178	180	171	119	193	213	207	193	192	171	171	181	189	>220	177	152	
LSZ37	Perimeter	No	Yes	208	213	>220	>220	>220		171	141	127	123	91	144	172		200	194	200		216		176	116	113	208	>220	220	212	127	215
LSZ38	Perimeter	No	Yes	116	147	151	150	161		144	156	137	146	153	163	153		150	134	175		165		161	141	176	166	128	178	195	113	>220
LSZ39	Perimeter	No	No	118	124	132	127	132		117	113	101	102		112	109		126	116	117		135		135	109	113	119	144	130	131	105	132
LSZ40	Interior	Yes	Yes	135	>220		>220	>220	>220		217	200	198	200	198	208	210	216	>220	209	>220	>220	>220	>220	210	193	>220	>220	>220	>220	>220	>220
LSZ42	Perimeter	No	Yes	130	163	182	190	194	190	188	192	195	193	181	188	101	193	183	102	184	166	190	194	180	184	189	187	190	193	195	200	202

Well	Well	Required to Reach	Reached Steam	Vapor Extraction	Formation Temperatures																										
	Location	Steam Temperature	Temperature (Calculated)	Max Temperature [°F]	8/3/15 [°F]	8/5/15 [°F]	8/7/15 [°F]	8/11/15 [°F]	8/13/15 [°F]	8/18/15 [°F]	8/20/15 [°F]	8/25/15 [°F]	8/27/15 [°F]	9/1/15 [°F]	9/3/15 [°F]	9/7/15 [°F]	9/9/15 [°F]	9/11/15 [°F]	9/15/15 [°F]	9/17/15 [°F]	9/21/15 [°F]	9/23/15 [°F]	9/29/15 [°F]	10/1/15 [°F]	10/6/15 [°F]	10/8/15 [°F]	10/13/15 [°F]	10/15/15 [°F]	10/20/15 [°F]	10/22/15 [°F]	10/27/15 [°F]	10/29/15 [°F]
UWBZ01	Interior	Yes	Yes	150	>220	163	>220	175	202	215	>220	>220	>220	0	97		>220	>220	>220	77	>220	68	>220	>220	>220	>220	140	>220	177	172	>220	205
UWBZ02	Interior	Yes	Yes	160	>220		198	>220	>220		>220	>220	>220	>220	>220	>220	>220	>220	>220	165	>220	>220	>220	190	>220	>220	>220	>220	>220	>220	>220	197
UWBZ04	Interior	Yes	Yes	188		191		166		111	>220	167	>220		143		146		145		>220		>220							205	217	39
UWBZ05	Interior	Yes	Yes	242																196	>220	>220	>220	>220	>220	>220	>220	>220	>220	214	200	196
UWBZ06	Interior	Yes	Yes	165	132	213	149	162	163	174	206	184	193	159	174	159	154	167	155	170	166	173	141	185	189	203	94	96	97	95	93	207
UWBZ10	Perimeter	No	Yes	179	166	179		164		196	192	219	126		172		170		>220		97		204	209	217	>220		>220	188	180	187	182
UWBZ17	Perimeter	No	Yes	220	196	205		>220		>220	>220	>220	>220		>220		>220		178		>220		162	>220	148	>220		>220	185	188	170	183
UWBZ18	Interior	Yes	Yes	180	97		144	191			>220	>220	>220	100	>220	182	>220	>220	>220	>220	104	156	>220	180	>220	>220	>220	162	>220	>220	>220	150
UWBZ19	Perimeter	No	Yes	146	>220	>220	>220	>220	>220	>220		>220	>220	>220	>220	>220	>220	>220	198	154	137	208	207	198	133	>220	>220	>220	209	198	94	182
UWBZ20	Dual Phase - Perimeter	No	No	112	108	116	105	106		112	115	107																108				
UWBZ21	Outside UWBZ	No	No	118	169	169	210	186	164	164		108	114		108	149	154	141	141	129	166	171	172	165	162	156	166	148	165	175	173	173
UWBZ22	Perimeter	No	No	127	95	128	138	138	158	147		154	155		121	120	136	130	115	100	121	140	136	143	155	170	158	164	82	131	133	134
UWBZ23	Outside UWBZ	No	Yes	131	206	172	170	211	211	>220		>220	190		213	197	203	211	62	>220	214	219	215	171	214	215	>220	>220	>220	218	208	213
UWBZ24	Dual Phase - Perimeter	No	No	190	95		100	125				93	92	133	153	107	158	109		154	110	125	150	111	140	139	155		106	95	94	
UWBZ26	Outside UWBZ	No	No	105	129	135	124	130		116	118	105	96	113	112	81		137	122	122		128		123	116	131	123	134	116	133	100	116
UWBZ27	Outside UWBZ	No	Yes	115	>220	>220	209	>220	>220	195	>220	95	111	>220	>220	90		>220	89	201		>220		165	210	191	>220	>220	>220	>220	105	>220

RED : at or above steam temperature (≥210 °F)
GREEN : below steam temperature (<210 °F)

22. NAPL Screening Results and Calculated Benzene Concentrations

Figures 27-29 below present the screening level results for NAPL detected in samples collected from MPE wells across the site. Screening samples are typically collected on a weekly basis. The figures below also include calculated benzene concentrations of groundwater samples collected from MPE wells across the site.

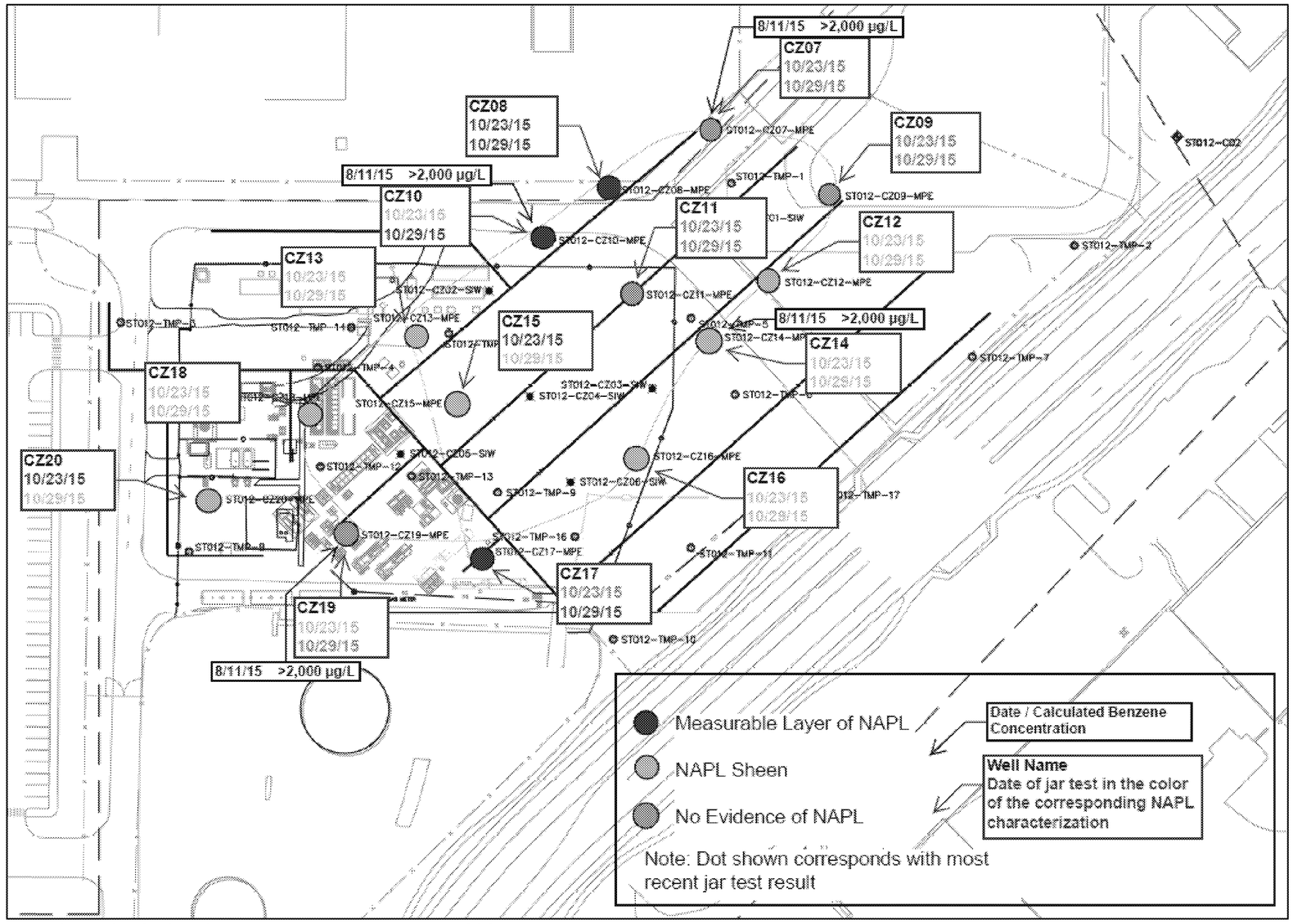

Figure 27. NAPL Screening Results and Calculated Benzene Concentrations – Cobble Zone

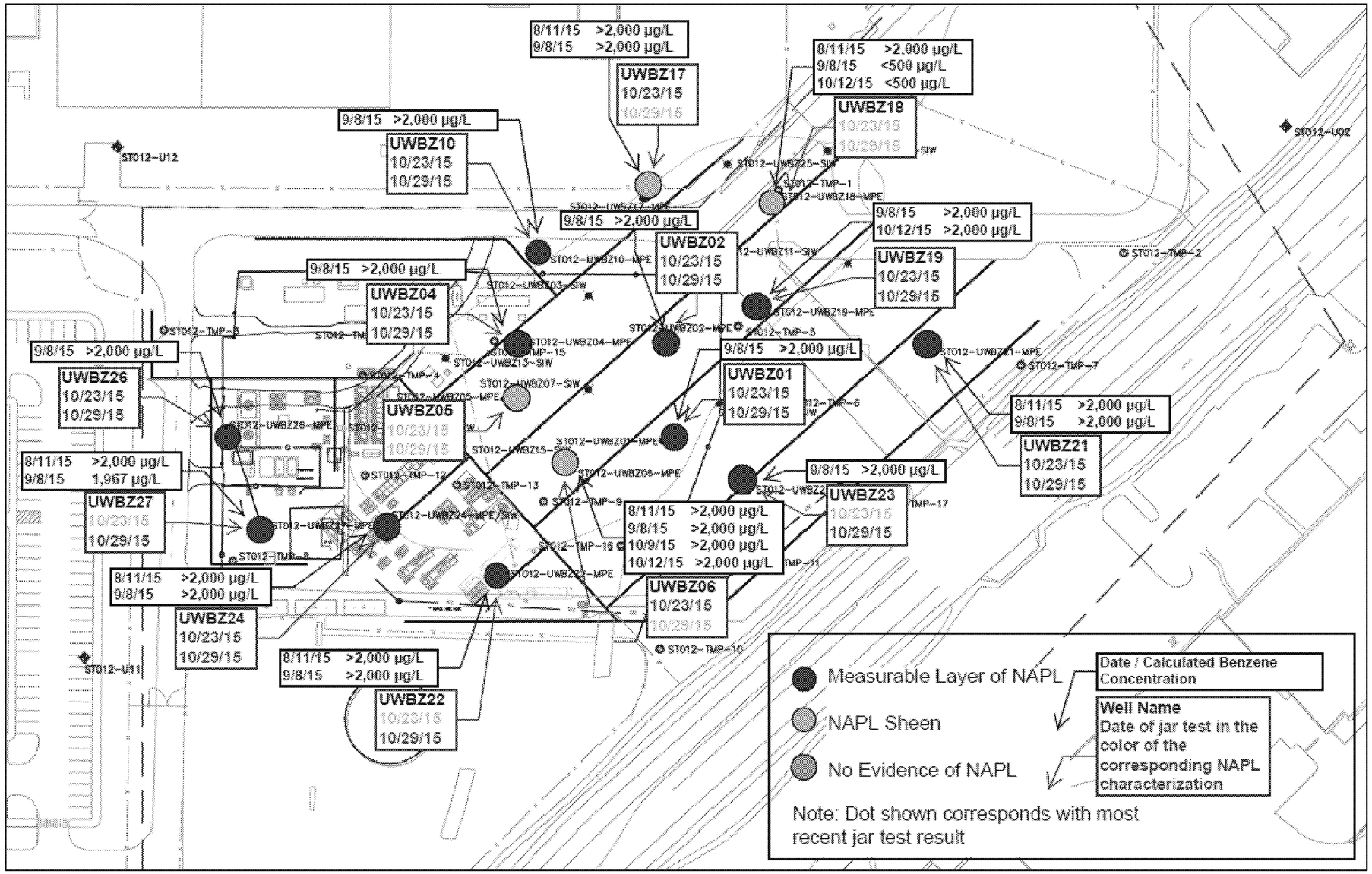

Figure 28. NAPL Screening Results and Calculated Benzene Concentrations – Upper Water Bearing Zone

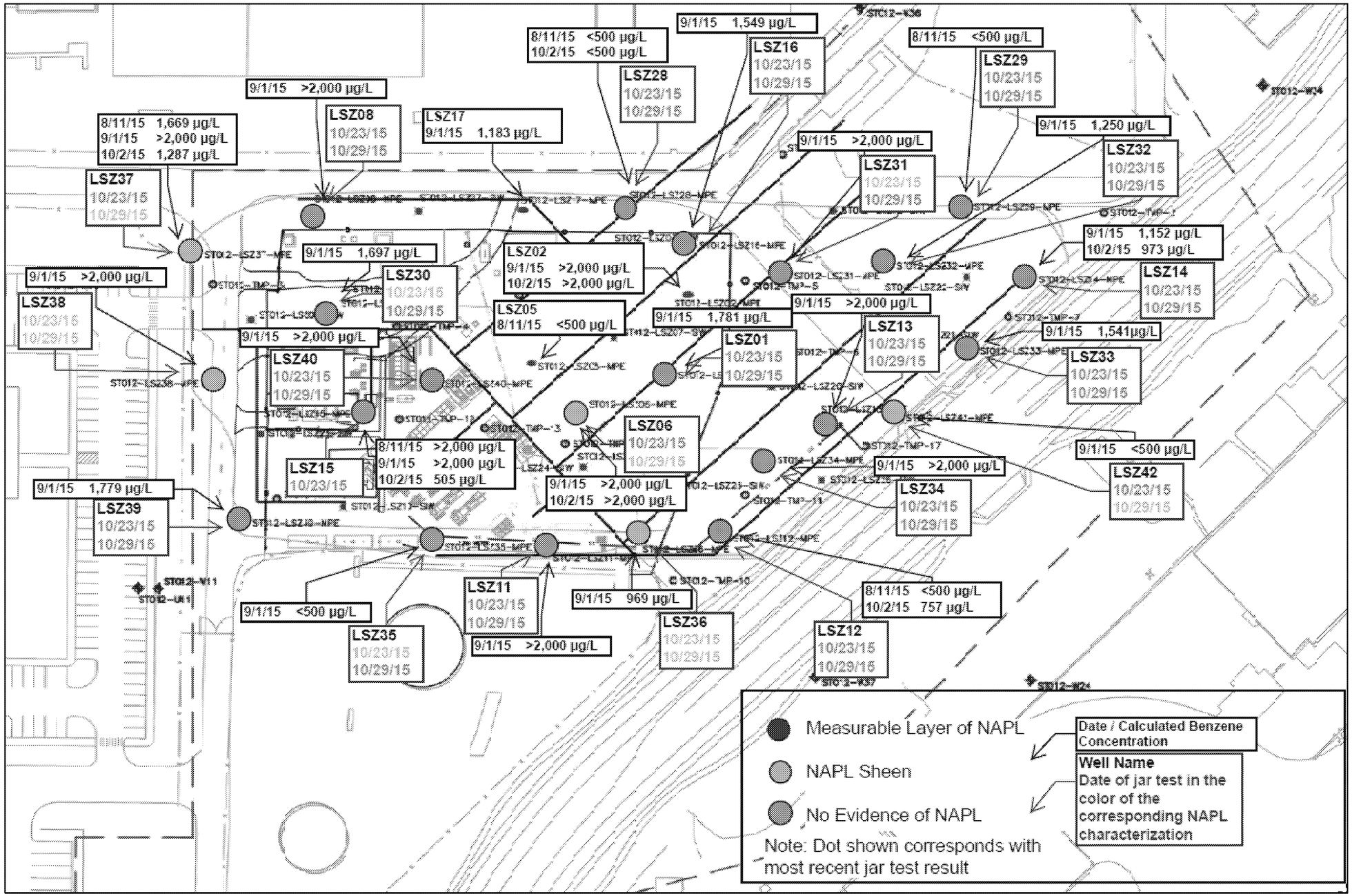

Figure 29. NAPL Screening Results and Calculated Benzene Concentrations – Lower Saturated Zone